Masculinities among irrigation engineers and water professionals in Nepal

Janwillem Liebrand

Thesis committee

Promotor

Prof. Dr Linden F. Vincent

Emeritus Professor of Irrigation and Water Engineering

Wageningen University

Co-promotors

Dr Margreet Z. Zwarteveen

Associate professor, Water Resources Management

Wageningen University

Dr Margreet P.M. van der Burg

Assistant professor, Gender Studies, Sociology of Consumption and Households

Wageningen University

Other members

Prof. Dr Bas J.M. Arts, Wageningen University

Prof. Dr Dipak Gyawali, Nepal Academy of Science and Technology, Nepal

Prof. Dr Nina Laurie, Newcastle University, United Kingdom

Prof. Dr Peter P. Mollinga, School of Oriental and African Studies, London, United Kingdom

This research was conducted under the auspices of the Graduate School of Wageningen School of Social Sciences.

Masculinities among irrigation engineers and water professionals in Nepal

Janwillem Liebrand

Thesis
submitted in fulfilment of the requirements of the degree of doctor
at Wageningen University
by the authority of the Rector Magnificus
Prof. Dr M.J. Kropff
in the presence of the
Thesis Committee appointed by the Academic Board
to be defended in public
on Wednesday 10 December 2014
at 1.30 p.m. in the Aula.

Janwillem Liebrand
Masculinities among irrigation engineers and water professionals in Nepal, 532 pages.

PhD thesis, Wageningen University, Wageningen, NL (2014)
With references, with summaries in English and Dutch

ISBN 978-94-6257-141-9

Contents

List of Figures xi

List of Tables xiii

List of Textboxes xiii

List of Annexes xv

List of Abbreviations xvii

Acknowledgements xxiii

Chapter 1:

Introduction: Studying masculinities in irrigation 1

1.1 Introduction 1

1.2 Meeting irrigation engineers and water professionals in India and Nepal 4

1.3 Objectives and research questions 5

1.4 Theoretical perspectives and key concepts 6

1.4.1 *Professional performance as cultural performance* 7

1.4.2 *Subjectivity, agency and performativity* 10

1.4.3 *Gender, masculinities and femininities* 14

1.4.4 *Intersectionality, class, caste and ethnicity* 17

1.4.5 *Hegemonic masculinity and norms of Elite Manhood* 25

1.4.6 *Irrigation governance, water professionalism and irrigation engineering* 29

1.5 Research methodology 32

1.5.1 *An anthropology through experience, performance and self-reflection* 32

1.5.2 *Interviews with the Irrigation Engineer* 37

1.5.3 *Questionnaire for the Irrigation Engineer* 38

1.5.4 *Documentation research* 39

1.5.5 *Case studies on Chitwan District and the Mechi project* 40

1.6 Limitations of this study and a word for (male) irrigation engineers 42

1.7 The structure of the book 43

Chapter 2:

Historical contexts of irrigation development in Nepal 45

2.1 Introduction 45

2.2 Irrigation development in Nepal... 45

2.2.1 *Self-governance sanctioned and taxed by Hindu courts (before 1950s)* 46

2.2.2 *Self-governance and basic needs policies (1980s onwards)* 47

2.2.3 *New ideals, civil works and the state bureaucracy (1920s onwards)* 49

2.2.4 *Competing interests and modes of irrigation management (1980s onwards)*........... 55

2.3 The education system and the civil service in Nepal (1950s onwards)........................... 57

2.3.1 *The education system*.. 57

2.3.2 *The civil service* 61

2.4 Why there are so few women irrigation engineers in Nepal 68

2.4.1 *The invention of "Nepalese women" as household managers (1950s)*..................... 71

2.4.2 *Creating wise mothers and competent wives (1960s and 1970s)*.............................. 75

2.4.3 *Identifying and prioritizing women's needs (1980s and 1990s)*............................... 79

2.2.4 *Unequal citizens (2000s onwards) and social organisers in irrigation* 85

2.5 Conclusions 89

Chapter 3:

Becoming an Irrigation Engineer: Roadways and institutions..................... 91

3.1 Introduction 91

3.2 Institution one: Engineering and water education 96

3.2.1 *A history of engineering and water education in Nepal*.. 97

3.2.2 *Who has access to engineering education?*.. 104

3.3 Institution two: Professional regulation and engineering associations 113

3.3.1 *Regulatory organisations for engineering in Nepal*... 113

3.3.2 *Professional engineering associations in Nepal* 114

3.3.3 *Who has access to regulatory organisations and engineering associations?*......... 117

3.4 Institution three: The Department of Irrigation... 121

3.4.1 *The early years of the department (1950s and 1960s)* 121

3.4.2 *From irrigation to water resources engineering (1970s and 1980s)* 124

3.4.3 *The consolidation of water powers in the DOI (1990s onwards)*............................ 127

3.4.4 *Who has access to employment and career advancement in the DOI?*................... 132

3.5 Conclusions 139

Chapter 4:

Becoming a "real" Irrigation Engineer: Pleasures, passion and agency ... 145

4.1 Introduction 145

4.2 The construction and performativity of a questionnaire... 149

4.3 Intersections between Elite Manhood and the Irrigation Engineer 151

4.3.1 *Cultural performances of DOI engineers at home and at work* 152

4.3.2 *Social stereotypes and cultural specific norms* 156

4.3.3 *Engineering and the characteristics of the Irrigation Engineer* 160

4.4 The cultivation of desire and passion in the informal professional milieu 161

4.4.1 *Professional pleasures and priorities*.. 162

4.4.2 *Job satisfaction and performances of success*.. 165

4.4.3 *Roadways to success (and promotion) in the DOI* 167

4.5 Rites of passage for becoming an Irrigation Engineer 172

4.5.1 *Revisiting Victor Turner's theory on rites of passage and liminality* 173

4.5.2 *Communitas: Friendship and brotherhood among engineers*................................. 177

4.5.3 *Catharsis: Emotional transition of the self*.. 180

4.5.4 *Cathexis: Confirmation or re-aligning of passion into objects or persons*............. 182

4.6 Conclusions 185

Chapter 5:

The performance of "lady engineers" and "other men" in the DOI.......... 189

5.1 Introduction 189

5.2 Entry points of analysis 192

5.3 Workshop with female officers and engineers in the DOI... 195

5.4 Awareness of engineers about masculinities in the DOI.. 199

5.4.1 *Perceptions on the normative culture and male domination in the DOI* 199
5.4.2 *Is the DOI considered masculine by engineers?* 202
5.5 Negotiating self-normalization in the family and professional spheres 206
5.6 Chances for transitional performances in the college and in the field 210
5.7 The biggest taboo for women engineers: Working "in the field" 214
5.8 Accumulation of disadvantages and career plateaux 219
5.8.1 *A summary overview of gendered disadvantages* 221
5.8.2 *Plateaux in careers and 'exclusion' of women engineers in the DOI* 225
5.9 Conclusions 228

Chapter 6:

The performativity of data and policy in Nepal on irrigation 233

6.1 Introduction 233
6.2 The performativity of state irrigation development in Nepal 236
6.2.1 *The experience of first-generation irrigation engineers and policy makers* 238
6.2.2 *The construction of data on irrigation development* 242
6.2.3 *The "reality" of mainstream irrigation data* 246
6.3 What irrigation data in policy do 251
6.3.1 *Layer one: The irrigated area* 251
6.3.2 *Layer two: Year round irrigation and system technology* 253
6.3.3 *Layer three: Sources for irrigation* 253
6.3.4 *Layer four: System control and irrigation policy* 255
6.3.5 *The reality of data on irrigation: The enactment of P/A/STHA* 260
6.4 Performances of "masculinity" in the COP of the Irrigation Organisation 261
6.4.1 *Intersection one: Nationality and foreign aid* 262
6.4.2 *Intersection two: Institutional affiliation and professional discipline* 264
6.4.3 *Intersection three: Gender, caste, ethnicity* 265
6.5 Conclusions 268

Chapter 7:

Our knowledges ourselves: A self-portrait of irrigation knowledge 271

7.1 Introduction 271
7.2 The hydraulic mission: Hegemony, knowledge and masculinities 274
7.3 An introduction to Chitwan District 277
7.3.1 *General background* 277
7.3.2 *The closing of the land and water frontier* 281
7.3.3 *An exemplary case of the hydraulic mission in Nepal* 282
7.4 Chitwan before the hydraulic mission (before 1950s) 285
7.4.1 *The Terai, the Tharus and the court in Kathmandu* 285
7.4.2 *The irrigation skills of the Tharu* 293
7.5 The development of the hydraulic mission in Nepal (1946-1970) 299
7.5.1 *Foreign ideas on water works and water planning being introduced in Nepal* 300
7.5.2 *A 'TVA in Nepal' in the Rapti valley* 304
7.5.3 *From multipurpose water resources development to irrigation* 311
7.5.4 *'Now it is left to man's ingenuity and resources to utilize [water]'* 315
7.6 The hydraulic mission in Chitwan (1950s onwards) 320
7.6.1 *Rapti Valley Development Project (1950s and 1960s)* 320
7.6.2 *Chitwan Valley Development Project (1970s and 1980s)* 325
7.6.3 *East Rapti Irrigation Project (1990s)* 335
7.6.4 *Irrigation Management Transfer Project (1990s and after)* 344
7.7 Conclusions 349

Chapter 8:

General discussion and conclusions 353

8.1 Introduction 353
8.2 Masculinities among irrigation engineers and water professionals 355
8.2.1 *Masculinities in education, professional associations and the DOI* 358
8.2.2 *Masculinities in self-normalization and transitional performance* 360
8.2.3 *Negotiating masculinities: Women engineers and "other men" in irrigation* 362

8.3 Masculinities in irrigation knowledge and water expert thinking 364
8.3.1 *Expressions of "masculinity": The performativity of irrigation data in policy* 367
8.3.2 *Dealing with "our" masculinities: Performing irrigation expert knowledge* 369
8.4 Self-reflections on performances of masculinity in research 371
8.5 Further and future research.. 373

References **381**
Annexes **409**
List of publications **489**
Summary **493**
Samenvatting **497**
Curriculum Vitae **503**
WASS Training and supervision plan **505**

List of Figures

Figure 1.1: The Nepal caste pyramid 22
Figure 1.2: The population by caste and ethnicity in Nepal 23
Figure 1.3: Performing masculinity in India 34
Figure 1.4: Performances of masculinity in Nepal 35
Figure 2.1: Population growth and irrigation development in Nepal 48
Figure 2.2: Public irrigation expenditure and agricultural productivity in Nepal 51
Figure 2.3: Distribution of irrigable land in Nepal 53
Figure 2.4: Time line of some important events in Nepal 54
Figure 2.5: Roadways in education in Nepal 59
Figure 2.6: Age and gender in the civil service in Nepal 66
Figure 2.7: Caste/ethnicity of the civil service at gazetted class levels 67
Figure 2.8: Organizational structure of the civil service based on total staff 68
Figure 2.9: Education level of the total staff of the civil service in Nepal 68
Figure 2.10: Women village development workers at work in the field in the 1950s 74
Figure 2.11: Training women village leaders to cut pipes in 1988 83
Figure 3.1: Roadways for getting involved in irrigation professionalism in Nepal 94
Figure 3.2: Institute of Engineering, Pulchowk Campus, Kathmandu 99
Figure 3.3: The engineering education system in Nepal (2008) 102
Figure 3.4: The irrigation education and training system in Nepal (1989) 103
Figure 3.5: Nepalese students in India for engineering education 108
Figure 3.6: Background of students for Diploma Civil Engineering at the IOE 109
Figure 3.7: Background of students for Bachelor Civil and Agricultural Engineering 110
Figure 3.8: Background of students for Master in Engineering or water related subject 111
Figure 3.9: Engineers’ Day celebrated by the Nepal Engineers’ Association 120
Figure 3.10: Water resources development agencies at central level 129
Figure 3.11: Organizational chart of the DOI 130
Figure 3.12: Age and gender group pyramid of core staff in the DOI 132
Figure 3.13: Caste and ethnicity of DOI staff at higher and lower management levels 133
Figure 3.14: Number of personnel in the DOI per discipline or job 134
Figure 3.15: Organizational structure of the DOI based on total staff 135
Figure 3.16: Education level of the core staff of the DOI 136
Figure 3.17: Getting posted at attractive positions 137
Figure 4.1: Rites of passage for becoming an Irrigation Engineer 176
Figure 4.2: Communitas at the college and in the field 179
Figure 4.3: Cathexis – assigning mental or emotional energy onto objects 183

Figure 5.1: Engineers and officers in the DOI 198
Figure 5.2: Career path exercise of Mrs. Maharjan... 226
Figure 5.3: Career path exercise of Mrs. Shrestha 227
Figure 6.1: 'Fig. XIII Long term irrigation development projects' 241
Figure 6.2: Irrigated area in Nepal 249
Figure 6.3: Irrigated area per scheme type in ecological zones of Nepal 250
Figure 6.4: Origin of funding for the agency assisted irrigated area in Nepal (1950-2005) .. 263
Figure 6.5: Agencies for the agency assisted irrigated area in Nepal (1950-2005) 264
Figure 7.1: Chitwan District in Nepal 279
Figure 7.2: Forest areas and main rivers in Chitwan District.. 280
Figure 7.3: The land and water squeeze in Chitwan District (1961-2001) 281
Figure 7.4: Irrigation project development in Chitwan District (1950-2010)....................... 284
Figure 7.5: The masculinity of a Tharu leader and jimindar in Chitwan District 288
Figure 7.6: Performances of masculinity in the Terai in 1889-90 290
Figure 7.7: Performances of masculinity in Chitwan in 1921 and 1945............................... 291
Figure 7.8: Performances of masculinity and state power in Chitwan in 1945 292
Figure 7.9: Jimindar patta (1937).. 296
Figure 7.10: Irrigation systems and structures of masculinity in Tharu areas in Chitwan..... 297
Figure 7.11: Bhim Bahadur Pandey and other men of the state going abroad...................... 306
Figure 7.12: A Nepalese project director reading literature on the TVA.............................. 309
Figure 7.13: New performances of masculinity in the Rapti valley and Terai (1950s) 310
Figure 7.14: A new experience of state irrigation development in Nepal in 1970 319
Figure 7.15: Intake of a modern irrigation system and a symbol of state planning 323
Figure 7.16: A shared experience of irrigation modernisation in Chitwan in the 1970s 329
Figure 7.17: Masculinities in the construction of the CIP project in 1978 330
Figure 7.18: Masculinities in irrigation system performance in the 1980s........................... 331
Figure 7.19: Masculinities in irrigation system performance in the 1990s........................... 332
Figure 7.20: An artistic view of what engineers can do.. 334
Figure 7.21: The enactment of an experience of irrigation development in 1989 337
Figure 7.22: The enactment of an alternative experience in irrigation in Chitwan in 1993... 338
Figure 7.23: The professional performances of researchers in irrigation 341
Figure 7.24: New performances of masculinity in irrigation in the 1990s 347
Figure 7.25: New performances of masculinity in irrigation in the 2000s 348
Figure 8.1: Breathing life into the Trishuli Lothar Diversion Project................................... 378

List of Tables

Table 2.1: Roadways in the civil service in Nepal ... 63
Table 4.1: Gender and class category of respondents ... 152
Table 4.2: Marital status of respondents and occupation of wife or husband ... 154
Table 4.3: The person who gave inspiration to study engineering ... 154
Table 4.4: Preferences of respondents for the studies of their children ... 156
Table 4.5: Important tasks in irrigation ... 163
Table 4.6: Priorities in the irrigation sector ... 163
Table 4.7: Job satisfaction by gender and class category ... 166
Table 4.8: The technical and cultural performance required for a career in the DOI ... 170
Table 4.9: The activities of officers in the DOI ... 171
Table 5.1: Overview of female engineers and officers in the DOI ... 196
Table 5.2: Perceived male domination at management levels in the irrigation sector ... 201
Table 5.3: Behaviour towards women colleagues in the DOI ... 202
Table 5.4: Card-definitions of masculine working cultures in the DOI ... 205
Table 5.5: Associated characteristics of engineers and lady engineers in the DOI ... 209
Table 5.6: Gendered disadvantages on the roadway for becoming an Irrigation Engineer ... 220
Table 6.1: The evolution of data on state irrigation development in Nepal ... 244
Table 6.2: Irrigation development according to the irrigation data ... 247
Table 6.3: Infrastructure development in agency implemented or assisted projects ... 250
Table 6.4: An example of the categorization of irrigated area in two DOI projects ... 252
Table 6.5: Professionals and actors contributing to the ADB report ... 267

List of Textboxes

Textbox 1.1: Background on the Mechi project, phase I (1987-1992) ... 41
Textbox 2.1: Informal practices in the civil service of Nepal ... 64
Textbox 6.1: Pauwa Sartap Irrigation Project in Panchtar District ... 257
Textbox 6.2: Panchakanya Irrigation System in Chitwan District ... 258

List of Annexes

Annex 1: Respondents of life history interviews 411
Annex 2: Respondents of the questionnaire 412
Annex 3: Libraries and documentation centres 413
Annex 4: Population growth and irrigation development in Nepal (1910-2010) 414
Annex 5: Annual irrigation expenditure and agricultural yield (1950-2010) 416
Annex 6: Status of education in Nepal 418
Annex 7: List of administrative services in the civil service of Nepal (2007) 418
Annex 8: Numbers on civil services in South Asia 418
Annex 9: Facts and figures of the civil service in Nepal 419
Annex 10: Student enrolment for engineering at various universities 420
Annex 11: Estimates of total student enrolment in engineering in Nepal in 2007 420
Annex 12: Government spending on higher education in engineering in Nepal 420
Annex 13: Foreign scholarships for Nepalese in engineering (1985-1988) 421
Annex 14: Call for engineers in 1969 422
Annex 15: Student enrolment data for diploma engineering in Nepal 423
Annex 16: Student enrolment data for bachelor engineering in Nepal 425
Annex 17: Student enrolment data for master engineering and/or science in Nepal 427
Annex 18: Scholarships available for Nepalese in the NRM sector around 2000 429
Annex 19: Overview of regulatory institutions in engineering 430
Annex 20: Overview of engineering associations 432
Annex 21: Facts and figures of the DOI 439
Annex 22: Background details of respondents of the questionnaire 441
Annex 23: Gender stereotypes among the respondents 444
Annex 24: Definitions of engineering 447
Annex 25: Goals that engineers seek to pursue in their career 449
Annex 26: Tasks, priorities and pleasures in the irrigation sector 450
Annex 27: Performances of success 451
Annex 28: Roadways in the DOI 454
Annex 29: Programme of the workshop with female officers and engineers in the DOI 457
Annex 30: Awareness of engineers about gender in the DOI 458
Annex 31: Awareness of engineers about gender in the field 460
Annex 32: The silent treat and mental violence at home 461
Annex 33: Gender biases at the entrance gate of the DOI headquarters 462
Annex 34: Sexual harassment and offensive talk by male engineers 463
Annex 35: Background on toilet visits in Nepal 465

Annex 36: Male officers’ reluctance to work with women in the field 466
Annex 37: Being treated as a second option 467
Annex 38: Gossip among male engineers about female engineers 468
Annex 39: Experiences of female engineers with male colleague behaviour 469
Annex 40: Career path of women and the double plateau 471
Annex 41: Summary of curriculum vitae of Mr. Nanda Kishore Agrawal 473
Annex 42: Summary of curriculum vitae of Mr. Bubanesh Kumar Pradhan 474
Annex 43: Definitions of irrigated area 475
Annex 44: Irrigated area (ha) in Nepal 476
Annex 45: Irrigated area (ha) per scheme type in the ecological zones of Nepal 476
Annex 46: Funding in the irrigation sector of Nepal (1950-2005) 477
Annex 47: Executing agencies in the irrigation sector of Nepal (1950-2005) 478
Annex 48: The ecological zones of Chitwan District 479
Annex 49: Population growth in Chitwan District 480
Annex 50: Landholdings in Chitwan and area under irrigation 481
Annex 51: Irrigation project development in Chitwan District (1950-2010) 483
Annex 52: Distribution of Tharu population in Chitwan District (1991) 485
Annex 53: Translation of the jimindar patta (1939) 486
Annex 54: Map of Chitwan (1959) and area targeted for settlement in the RVDP 487
Annex 55: A list of irrigation engineers who have worked in Chitwan District 488

List of Abbreviations

ABAN	: Association of British Alumni Nepal
ACTI	: Agricultural Credit Training Institute
ADB	: Asian Development Bank
ADB-N	: Agricultural Development Bank of Nepal
ADP	: Agricultural Development Project, Janakpur
AIT	: Asian Institute of Technology
AMIS	: Agency Managed Irrigation System
AO	: Association Organiser
APROSC	: Agricultural Project Services Centre
B/C	: Bahun/Chhetri
BE	: Bachelor of Engineering
BPfA	: Beijing Declaration and Platform of Action
BS	: Bikram Sambat
BSc	: Bachelor of Science
BUET	: Bangladesh University of Engineering and Technology
CAD	: Command Area Development
CAE	: Certificate of Architecture Engineering
CBS	: Central Bureau of Statistics
CEAPRAD	: Centre for Environmental and Agricultural Policy Research, Extension and Development
CEDAW	: Convention on the Elimination of All Forms of Discrimination Against Women
CIDA	: Canadian International Development Agency
CIP	: Chitwan Irrigation Project
CIWEC	: Canadian International Water and Energy Consultants
CL	: Certificate Level
CMIASP	: Community Managed Irrigation and Agricultural Sector Project
COP	: ‘community of practice’
CTEVT	: Council for Technical Education and Vocational Training
CV	: Curriculum Vitae
CVDP	: Chitwan Valley Development Board
DA	: Department of Agriculture
DBID	: Data Base for Irrigation Development
DDC	: District Development Committee
DEAN	: Diploma Engineers Association, Nepal

DFID	: Department for International Development
DOI	: Department of Irrigation
DOLIDAR	: Department of Local Infrastructure Development and Agricultural Roads
DIDW	: Department of Irrigation and Drinking Water
DIHM	: Department of Irrigation, Hydrology and Meteorology
DWIDP	: Department of Water Induced Disaster Prevention
ECWUCC	: East Chitwan Water User Coordination Committee
ERIP	: East Rapti Irrigation Project
FAO	: Food and Agricultural Organisation (UN)
FCAN	: Federation of Contractors Associations of Nepal
FEISCA:	: Federation of Engineering Institute of South and Central Asia
FFG	: Female Farmers Group
FIWUD	: Farm Irrigation and Water Utilization Division
FMIS	: Farmer Managed Irrigation System
GAD	: Gender and Development
GEWNet	: Gender, Energy and Water Network, Nepal
GON	: Government of Nepal
GSEA	: Gender and Social Exclusion Assessment
GWP	: Global Water Partnership
GWRDB	: Ground Water Resources Development Board
HMG-N	: His Majesty's Government of Nepal
HSE	: Higher Secondary Education
IAAS	: Institute of Agriculture and Animal Science
IAM	: Indian Aid Mission
ICE-I	: Institution of Civil Engineers, India
ICID	: International Commission on Irrigation and Drainage
ICIMOD	: International Centre for Integrated Mountain Development
IDE	: International Development Enterprise
IEI	: Institution of Engineers, India
IFAD	: International Fund for Agricultural Development (UN)
IIMI	: International Irrigation Management Institute
IIT	: Indian Institute of Technology
ILC	: Irrigation Line of Credit
ILO	: International Labour Organisation (UN)
IMC	: Irrigation Management Centre
IMP	: Irrigation Management Project
IMSSG	: Irrigation Management Systems Study Group
IMT	: Irrigation Management Transfer
IMTP	: Irrigation Management Transfer Project

INGO	: International Non-Governmental Organization
INPIM/N	: International Network for Participatory Irrigation Management/ Nepal
IOE	: Institute of Engineering
IOEAA	: Institute of Engineering Alumni Association
IOF	: Institute of Forestry
ISP	: Irrigation Sector Project
IWA	: International Water Association
IWHA	: International Water History Association
IWMI	: International Water Management Institute
IWRM	: Integrated Water Resources Management
IWRS	: Indian Water Resource Society
JICA	: Japan International Cooperation Agency
JTA	: Junior Technical Assistant
JUAAN	: Japan Universities Alumni Association Nepal
KIS	: Khageri Irrigation System
KTM	: Kathmandu
MA	: Master of Arts
ME	: Master of Engineering
MEFAP	: Mid-level Engineers Forum in Asia and Pacific Countries
MFAI	: Ministry of Food, Agriculture and Irrigation
MHIRDP	: Mechi Hill Irrigation and Related Development Programme
MOAC	: Ministry of Agriculture and Cooperatives
MOI	: Ministry of Irrigation
MOP	: Ministry of Power
MOWP	: Ministry of Water and Power
MOWR	: Ministry of Water Resources
MPLD	: Ministry of Panchayat and Local Development
MSc	: Master of Science
NAA	: Nepal Agricultural Association
NARC	: National Agriculture Research Council
NASC	: National Administrative Staff College
NC	: Nepali Congress
NCESS	: Nepal Civil Engineering Students Society
NEA	: Nepal Engineers' Association
NEC	: Nepal Engineering Council
NEC	: Nepal Engineering College
NEIDS	: Nepal Engineering Infrastructure Development Society
NESP	: National Education System Plan
NEWS	: Nepal Engineers' Wives Society

NFIWUAN	: National Federation of Irrigation Water User Associations Nepal
NGO	: Non-Governmental Organization
NLIS	: Narayani Lift Irrigation System
NPC	: National Planning Commission
NSAE	: Nepal Society of Agricultural Engineers
NWO	: Nepal Women Organisation
NWP/JVS	: Nepal Water Partnership/ Jalsrot Vikas Sanstha
NWREC	: National Water Resources and Energy Commission
ODC	: Organisation Development Centre
O&M	: Operation and Maintenance
PCL	: Proficiency Certificate Level
PCRW	: Production Credit for Rural Women
PDR	: Process Documentation Research
PIM	: Participatory Irrigation Management
PIS	: Panchakanya Irrigation System
PSC	: Public Service Commission
PWPA-Nepal	: Professional Women for Promotional Activity, Nepal
RVDP	: Rapti Valley Development Project
SAPPROS	: Support Activities for Poor Producers of Nepal
SCAEF	: Society of Consulting and Architect Engineering Firms
SDEF	: South Asian Association for Regional Corporation Diploma Engineers' Forum
SEANep	: Structural Engineers' Association Nepal
SIREN	: Society of Irrigation Engineers Nepal
SLC	: School Leaving Certificate
SNV	: Stichting Nederlandse Vrijwilligers (Dutch aid organisation)
SOPHEN	: Society of Public Health Engineers, Nepal
SPWP	: Special Public Works Programme
TVA	: Tennessee Valley Authority
UK	: United Kingdom
UML	: United Marxist Leninist
UN	: United Nations
UNDP	: United Nations Development Programme (UN)
UNESCO	: Educational, Scientific and Cultural Organisation (UN)
US	: United States
USAID	: United States Agency for International Development
USOM	: United States Operation Mission
USSR	: Union of Soviet Socialist Republics
VDC	: Village Development Committee

VDP	: Village Development Programme
VDW	: Village Development Workers
VIF	: Village Irrigation Facilitator
WB	: World Bank
WDO	: Women Development Officers
WECS	: Water and Energy Commission Secretariat
WFEO	: World Federation of Engineering Organisations
WHO	: World Health Organisation (UN)
WID	: Women In Development
WIO	: Women Involvement Officers
WPLUS	: Women Professionals in Land Use Sector
WUA	: Water User Association
WWF	: World Wildlife Fund
WWN	: Women Water Network

Acknowledgements

This thesis has been produced with the help, assistance and support of many people and I would like to acknowledge them. In a way, my research journey started in India, in 2002. One day before my departure to India for my internship at the IWMI-Tata Water Policy Programme of the International Water Management Institute (IWMI), I wrote a last minute e-mail to my Indian supervisor, Dr. Dinesh Kumar, to tell him that I was on my way. To my surprise, I received an urgent reply with the question whether I was a boy or girl student!? In e-mail communication, I had shortened my name to 'Jan' which is easier to pronounce in English than 'Janwillem', but I had not realized that Jan could also be a female name in the English language. With hindsight, I can say that the cooperation with Dr. Dinesh Kumar and other IWMI-Tata staff provided for a collegial environment in which I came to reflect on social interactions between engineers and professionals for the first time, also becoming aware of professional performances and masculinities in the world of irrigation. With these interactions, the initial ideas for this research have developed.

I proceeded my research journey on the topic of masculinity in irrigation in 2007, when I applied for a junior research position on the theme 'gender in irrigation' at the Irrigation and Water Engineering Group (IWE, now Water Resources Management Group) of Wageningen University. The then manager of the group, Gerrit van Vuren sent to me an e-mail to inform me that I had been selected for the post. The e-mail started with something like 'a man on gender, is that possible?' To Gerrit, who left from our midst too soon, I would have liked to say that it is. His question marked the start of an intense research process. Thank you, Gerrit, for all the work that you have done in making this project possible.

Professor Linden Vincent of the IWE Group brought to my attention PhD funding opportunities and a call for proposals under the Scaling and Governance theme of the university. One of our proposals resulted in the admission and granting of this PhD project as a combined effort of the IWE Group and the Rural History Group with Pim Kooij as acting Chair at that time. Linden, I am very grateful for this and for your patience and openness in discussions. Also a big thanks to you for your thorough feedback in the last phases of writing; it really has helped me to finalize the thesis.

Margreet Zwarteveen and Margreet van der Burg have acted as my supervisors. Margreet Zwarteveen has inspired me to do PhD research in irrigation on masculinities. She also had been my internship and master thesis supervisor and I have felt it as a privilege to do a PhD under her guidance. Margreet, I have always felt enthusiasm and encouragement from your side and I have really appreciated that. Likewise, Margreet van der Burg has been a source of inspiration for me to pursue research on gender issues in the perspective of rural history. Margreet, thank you for always being ready to listen to me and for commenting on my work with great detail.

Nepal Engineering College (*NEC*) has been the host organisation in Nepal for this research and their support is gratefully acknowledged. The people at *NEC* are inspiring professionals and I really enjoyed the cooperation. Principal Deepak Bhattarai has been very forthcoming in support and in organising the necessary formalities. I also want to thank in particular Dr. Hari Krishna Shrestha, Dr. Khem Raj Sharma, Mr. Ashutosh Shukla, Mr. Poorna Bhadra Adiga and Mr. Robert Dongol. Patiently, they listened to my inquiries and they put me in touch with other people. Ashutosh Shukla provided me with a first background on irrigation in Chitwan and his insights have critically informed my research on the district.

In Nepal, I relied on a broader network of professionals and researchers. I want to thank Dr. Prachanda Pradhan of the Farmer Managed Irrigation System Promotion Trust for his help. His bibliography on irrigation and the conversations that I had with him were a great source of information and I acknowledge the opportunity that I was given to present some of my work at a seminar of the Promotion Trust in 2010. I also thank Dr. Upendra Gautam of the Promotion Trust for having an interview with me. During my time in Nepal, I had short conversations with Mr. Ajaya Dixit and Professor Dipak Gyawali, which helped me to get introduced to irrigation and water issues in Nepal and also to conceptualize my research through their writings. In this regard, I also would like to thank Dr. Lynn Bennett, social scientist and consultant at the World Bank. She pointed out to me her work on the Gender and Social Exclusion Assessment (GSEA) in Nepal and showed interest in my research work.

For this research, I have interacted a lot with engineers and officers of the Department of Irrigation (DOI) in Nepal, some of them retired or ex staff, and I would like to acknowledge their cooperation. In particular, I thank Mr. Madhav Belbase, Mr. Suman Sijapati, Mrs. Suman Rimal Gautam, Mr. Bhubanesh Kumar Pradhan, Mr. Nanda Kishore Agrawal, Mr. Uttam Raj Timilsina, Mrs. Ezee G.C., Mrs. Sanu Shrestha, Mr. Babu Ram Adhikari, Mr. Nasiruddina Ansari, Mr. Surya Bhakta Uphadya, Mr. Bharat Mani Dhital, Mr. Shankar Man Singh Basnet, Mr. Cherchan Thakali, Mr. Manoj Thapa and Mr. Mohan Lohani. Dear engineers and officers, I really enjoyed our conversations and time together.

I also would like to acknowledge the following persons in relation to this research. Pranita Udas Bhushan and Bala Raju Nikku were friends and ‘Wageningen colleagues’ for me in Nepal and their door was always open for me. Pranita and Raju, I really enjoyed our conversations on life and PhD research, a big thanks to you. Rajendra Uprety, an officer of the Department of Agriculture and also doing a PhD at Wageningen, was always ready to talk with me. Dr. Anjal Prakash of SaciWaters (India) showed interest in my research work. Likewise, Dr. Sara Ahmed (International Development Research Centre, IDRC), who I knew from my internship in India, repeatedly asked about my work. Bhawane and Kiran Upadhyay, who I also knew from my internship, invited me to their house in Kathmandu and with Bhawane, I discussed issues of gender in Nepal. I thank Dr. Olivia Aubriot (Centre d'etudes Himalayennes), Professor Peter Mollinga (School of Oriental and African Studies), Dr. Jeevan Raj Sharma (Tufts University) and Dr. Mandira Shrestha (International Centre for Integrated Mountain Development) for commenting on my work, having conversations and discussing ideas. I thank Dr. John Ambler (Oxfam, America) for finding time in his busy schedule to talk about his time at the Ford Foundation as a programme officer. I thank Mr. Huta Ram Baidya, who is known as the first agricultural engineer in Nepal, for his patience to give an interview to a young Dutch researcher. I thank Mr. Ramesh Parajuli (Martin Chautari) for giving me the opportunity to present some of my work to an audience of scholars, and I thank Mr. Madhusudan Subedi, a medical anthropologist, for explaining to me the intricacies of toilet visits in the field and for clarifying the dimensions of women's security in Nepal in relation to this.

In regard to research work in Chitwan District, I want to thank Dr. Thomas Robertson (Worcester Polytechnic Institute, Massachusetts) for our conversations about developments and changes in Chitwan in the 1940s and 50s. Hereby, I also acknowledge the cooperation of all respondents in Chitwan. In particular, the family of Mr. Bishnu Hari Devkota (a previous chairman of Panchakanya Irrigation System). I was always welcome for dinner and his sons, Chanchal and Uijwal, helped out with getting around, translation and support of students. Thanks a lot for that. I also gratefully acknowledge the cooperation of other farmer leaders and village representatives: Mr. Maya Ram Chaudhary and Mr. Janak Lal Chaudhary (Meghauli), Mr. Guna Raj Pathak (a previous chairman of Narayani Lift Irrigation System), Mr. Bel Bahadur Gurung (chairman of Khageri Irrigation System), Mr. Bimal Mahato (secretary Patihani Parsa Jagatpur Irrigation System), Mr. Satya Chaudhary (Bachhauli) and Mr. Santa Kumar Chaudhary (Khaireni).

In Chitwan, I was aided by Assistant Dean Dainik B. Nepali Karki of the Institute of Agriculture and Animal Science (IAAS), who contacted students to help me out with some survey work on irrigation and water use. His cooperation is acknowledged and I want to thank the students Madhav Regmi, Elina Adhikari, Anjan Neupane, Bijaya Upadhya, Saroj Parajuli and Rama Paudel for assisting me in the survey. It was nice to get some insight in student life at IAAS. In relation to this part of research, I also thank Mrs. Seema Kulkarni of the Society for Promoting Participatory Ecosystem Management (SOPPECOM), India. The survey results

were used for a project called Water Equity Gauge in an effort to document structural inequities in access to water and Seema invited me to Pune, India to discuss the results.

In relation to research work on the Mechi Hill Irrigation and Related Development Programme (1987-1991), I gratefully thank Arend van Riessen. He has been very forthcoming in sharing his experiences on irrigation in Nepal and I really enjoyed cooperation. Arend, a big thanks for planning a trip to the Mechi hills and also for the supervision of Wageningen students. I also thank other ex-SNV staff for their enthusiasm in interviews: Durgha Baniya, Puspa Mani Gautam, Chandra and Indu Sanjel, Arjen Snaterse, Berend van Bon, Wil Verschoor and Jan Kroon.

In my research work in Nepal, I was assisted by four research assistants and without them, this thesis would not have existed. Basanta Gautam helped out in documentation research and he was able to dig up many 'lost' documents. Saroj Yakami joined me in most field trips to Chitwan and the Mechi hills. Raj Kumar G.C assisted me in research in Kathmandu, locating people and making an overview of engineering associations. Shovana Maharjan, a student of *NEC*, assisted in transcribing interviews and also helped out in a group interview with engineers of the Department of Irrigation. A big thanks to you all.

In relation to documentation research in Kathmandu, I also thank Umesh Archary (Winrock, Nepal) for locating documents, Mr. Sajan Subedi (Madan Puraskar Pustakalaya library) for finding photos of Chitwan District, Dr. Dinesh Raj Panta for translating an old historical document (*jimindar patta*), Ms. Poonam R. L. Rana for making available the diary of B.K. Malla (the director of the Rapti Valley Development Project, Chitwan) and Ms. Stuti Basnyet K.C. (US Agency for International Development, Nepal) for making photos available of early development projects in Nepal.

In Nepal, we (Riti and I) received help from a number people to get around in Kathmandu in the beginning. It was through the network of Bert Bruins and Annelies Heijmans, who stayed in Nepal for a long time in the 1990s, that we got to know John Hummel (SNV) and Monique Beun (UNICEF). They welcomed us in their house in Kathmandu for the first two weeks. Bert, Annelies, John and Monique, thanks a lot for getting us started. I also thank Kari Cuelenaere of the Dutch consulate for sorting out visa formalities and introducing us to the Dutch network in Kathmandu. I thank Bijay Rai of Axis Holidays for sorting out our travels in Nepal. Bijay, thanks a lot for your help in organising our journey to the Netherlands when my grandmother passed away. I thank Geeta Manandhar of the Namaste Institute for Cross-Cultural Experience for the lessons in the Nepalese language and I thank Medha Pokhrel and her family, from whom we rented a flat and who sorted out the everyday challenge in

Kathmandu of clean water supply and access to electricity. Medha, you have been a warm hostess for us and thanks for looking after our dog when we were away.

In Nepal, Riti and I built up a social network of friends with whom we shared fun and (work) experiences. In particular, we have warm memories of shared time with Ken Afful and his family, Erni and Herma van Wingerden and their children, Nico and Astrid Smith and their children, Ben and Tanja Kruk, Rhian Cadvan-Jones and Richard Luff, and with Peadar O'Dailaigh and Anna Guiney. I also thank all the team members of the United Nepal Football Club (UNFC), also known as the Mighty Yaks. The goals were truly beautiful, the fouls really ugly and the matches against the military and police teams, and the British School a disaster (too many egos), but a game always helped me to clear my mind and see things sharply again.

In the period 2008-2009, when I developed my research proposal, I participated in the network of the Action Research Action Learning Interest Group (ARALIG). I gratefully thank Professor Nadarajah Sriskandarajah, Professor Birger Steen Nielsen, Professor Kurt Agaard Nielsen and Cristian Ferrari-Alarcon for the discussions we had during the workshops in Budapest, Wageningen and Uppsala; they formed a nice environment for reflection. In regard to my PhD training, I also thank Professor Rosemarie Buikema and Professor Gloria Wekker of the NOISE Summer school of the Netherlands School of Gender Studies, Utrecht for listening to my questions and for commenting on an essay. The lessons in feminist perspectives were truly inspiring and they have informed the theoretical framework of this thesis. I also thank Iris van Huis with whom I did an interview with Ton van Elst (Movisie, Utrecht) to learn more about the codes of masculinity (*mannelijkheidscoderingen*) that he had developed in the 1980s to facilitate male therapy work. The cooperation of Ton van Elst also is gratefully acknowledged.

In the Netherlands, the IWE group at Wageningen University formed a warm environment to do a PhD and I thank my colleagues: Frans Huibers, Kai Wegerich, Edwin Rap, Flip Wester, Alex Bolding, Gerda de Fauw, Maria Pierce, Pieter van Oel, Arjen Zegwaard, Lisa Bossenbroek, Juana Vera Delgado, Jaime Hoogesteger van Dijk, Henk Ritzema, Saskia van der Kooij, Rutgerd Boelens, Gertjan Veldwisch, Deepa Joshi, Petra Hellegers, Harm Boesveld, Gerardo Halsema, Andres Verzijl, Carolina Dominguez Guzman, Nynke Post Uiterweer, Jonas Wanvoeke, Milagros Sosa Landeo, Patricio Mena Vasconez, Jean-Philippe Venot and Jeroen Vos. Dear all, you truly are wonderful people and I learned a lot from you.

Many ideas for research also developed or were explored in supervision of students of Wageningen University and *NEC*. In this regard, I thank Liekel Boer, Casper de Vries, Maximillian Manderscheid, Rose-Liza Kouwenhoven, Hans Verboom, Joël Verstoep, Raj

Kumar G.C., Diego Garcia-Landarte Puertas, Suresh Laudari, Sonam Pem, Manpriet Singh, Muna Adhikari and Diederick Koetsier.

Friends in the Netherlands and Nepal visitors have formed an indispensable network for me to get through the highs and lows of PhD work, particularly during the writing phase. I thank the following people for their efforts to make sure that I did not take my work too seriously: Jasper van der Linden, Gertjan Becx, Rixt Komduur, Bernd Slesazeck, Martin Folkerts, Lisa Verberne, Sander van Delden, Anne Wanders, Christiaan Biemond, Wilma Steeneveld, Pieter-Jelte Lindenbergh, Joep de Greef, Liesbeth de Theije, Vera Jansweijer, Maartje van Reedt Dortland, Johan Ruijten, Wouter Beekman, Willemijn de Vos, Yvan Lopez, Femke Gordijn, Anneke Pullen, Mark Post, Raymond and Maria von Schukkmann, Coen van der Steen, Mark and Linda Prose, Gijs Beijers, Ans Beijers, Joost Berkhout, Eleni Braat and Bertine Kamphuis.

During the writing process, two other groups of social beings have been important for me. The first is the fourth football team of GVC, Wageningen. Like with the UNFC team in Nepal, also this team is desperately looking for an injection of top talent; results have been a disaster, but the games have helped me to clear my head. The second is a group of dog owners who I came to know in Wageningen while walking with our chicken-loving family-companion Rambo. Dog owners tend to go by the name of their dog, so I want to thank Schubert, Tommie, Luni, Lucy, Quincy, Chica, Chico, Obi, Ceres, Jean, Jack, Milo, Speedy, Chaffy, Billy, Willem, Felix, Guusje and Gijsje. Dear dogs, the daily talks with your owners have helped me to keep my feet on the ground.

Last but not least, I want to thank my dear family: Riti, Katalin, Hans, Ineke, Diederik, Sietske, Andrea, Marte, János, Hannie, Rebekka, Sándor, Simon, Daniel, Astrid, József, Rita, Daniel jr., Jannes, Suzie and Steven. Your colourful lives have been an enduring source of inspiration for me and without your love, encouragement, support, kolbász, pálinka and wedding parties in the Netherlands, Hungary and Romania, I would not have been able to finish this PhD thesis.

Chapter 1:

Introduction: Studying masculinities in irrigation

1.1 Introduction

More than two decades of mainstreaming gender in development research and policy have failed to come to grips with the masculine subject (Laurie, 2005). This appears particularly true in development for professions that are traditionally treated as fields of engineering and technology, such as rural infrastructure development and natural resources management (Adhikary, 1995). The profession of irrigation and water management – the field of my professional education – is exemplary. Gender and women have earned a legitimate place in water research and irrigation policy agendas, but it is no exaggeration to say that the professional irrigation context is still a 'man's world' (Zwarteveen, 2011: 40). I say this based on personal experience as a male water professional and also, because I am inspired by feminist theory and academic questioning of masculinities in irrigation (Zwarteveen, 2008; 2010; 2011). Travelling from the Netherlands to India and Nepal to study irrigation and water management, first as a graduate student in 2002-2003 and then as a PhD researcher in 2008-2011, I have shared acts of professionalism and performances of masculinity with fellow (male) professionals across intercultural borders, based on an assumed sharing of manhood identity. In the process of doing my job, I developed an experience that there is something masculine about the irrigation and water management profession, both in the Netherlands and in South Asia. To be clear at the onset of this book, I do not always see this as a problem; every professional, institutional and organisational culture is gendered (Acker, 1990; Collison and Hearn, 1996; Czarniawska, 1997; 2006; Ely and Meyerson, 2000), also in non-engineering disciplines, and the masculinity of a professional culture is often associated with many positive things like courage, leadership, perseverance and rationality. Nevertheless, I suggest that it is worth investigating masculinities in irrigation professionalism because it can enrich the gender debate in development and it might tell us, for instance, how masculinities are implicated in the way we see, discuss and do irrigation and water management, and how it informs the politics of institutions and the global system of development.

The debate in development on gender – not just in irrigation and water management – seems to have reached a paradoxical status quo and there are reasons to assume that an inquiry into masculinities in irrigation adds fresh dimensions to the debate. On the one hand, mentioning 'women' in a professional irrigation context is much less of an anomaly than it used to be some two or three decades ago (Zwarteveen, 2006) and government engineers, consultants, foreign water experts and researchers in irrigation today discuss gender issues professionally and rationally, working hard to meet social equity and gender goals in irrigation (see Udas and Zwarteveen, 2010 for an example of a Nepalese irrigation engineer). On the other hand, professionals in irrigation, be it from the West or from South Asia, are still mainly men and over three decades of gender debate in irrigation has failed to create a reassuring environment for women graduates to perform as engineers and professionals in the water sector (SaciWaters, 2011). This situation has given credit to the view of some feminist scholars that the gender debate in development has mainly boosted the position and status of male professionals, particularly of those who do global advocacy and national policy making. They are said to have taken all the credit in promoting women's concerns in development by getting the policies right (see Tamang, 2002 for Nepal). The habit of equating gender issues with (grassroots) women's issues in development and the modernist idea that women's empowerment can be implemented top-down, seem to have done more damage than good. The trend is that women are treated as victims – not as agents. At the professional level in irrigation these circumstances have given rise to a view that gender issues in development are unrelated to the gender of professionals and engineers, and can be dealt with irrespective of gender issues among professionals. To challenge this view and address the continued 'absence' of women professionals in water expertise in South Asia and elsewhere, this thesis investigates the masculinity of the irrigation profession by taking Nepal as a case study.

The conceptual seed of this thesis lays with the work of Margreet Zwarteveen, one of my supervisors and associate professor of the Irrigation and Water Engineering group (IWE, now Water Resources Management group) at Wageningen University, the Netherlands (Zwarteveen is now professor Water Governance at IHE Delft, the Netherlands). Her work addresses the invisibility of women in irrigation and a culture of male hegemony in irrigation professionalism (see Zwarteveen, 2006 for an overview). This thesis is directly inspired by her recent work in irrigation on masculinities (Zwarteveen, 2008; 2010; 2011). This work explores a new research agenda on the linkages between men, masculinities and water powers in irrigation. For this purpose, Zwarteveen (2011) classifies the irrigation world as a masculine world along the lines of three dimensions:

1. ***Men's control over rights to irrigation water and infrastructure:*** The first dimension of the masculinity of irrigation is that rights to irrigated land and rights to participate in irrigation decision-making, almost everywhere in the world, are predominantly vested in men. Male irrigators and farmers have significantly more possibilities to own irrigated land and water than female irrigators and farmers do. As heads of the household, they are expected to represent the household in the public. Women are important providers of labour to irrigated agriculture and to canal maintenance and cleaning, but they often do not themselves control the fruits of their work, and their work is also typically valued less than men's work in irrigation. Likewise,

membership of irrigators' associations tends to be reserved for men, with participation in public meetings is often seen as an activity that belongs to the domain of men.

2. ***Male domination in the professional irrigation domain:*** The second dimension of the masculinity of irrigation is that the professional irrigation domain is dominated by men. This is most obvious in the observation that most irrigation professionals (engineers, experts, managers, planners, consultants and researchers) are men. It also is evident in the observation that the professional involvement in irrigation, be it as an engineer, expert or policy maker, is very much identified and perceived as a male activity, or as an activity belonging to the domain of men.

3. ***Gendered thinking in irrigation knowledge:*** The third dimension of the masculinity of irrigation is that the thinking in irrigation knowledge is gendered. Irrigation knowledge has long rendered thinking and speaking about women irrelevant, and most current discursive interpretations of irrigation realities continue to emphasise and attach greater value to those activities and experiences that are associated with men. There also exists a strong epistemic tradition in irrigation expert thinking that sees the world as uniform, makeable and manageable. This is a way of knowing irrigation that offers little conceptual space for appreciating the experiences of people other than those of professionals and it is a knowledge practice that is deeply inhospitable to the analysis of (unequal) social relations and gender.

Most work in irrigation on gender to date has focussed on the first dimension of masculinity and can be seen as a feminist project of 'making women visible' in irrigation (Zwarteveen, 2008: 111). It extends visibility to women as political subjects in irrigation – as farmers and active water users – and scrutinizes the normative function of language in irrigation which either reveals or distorts that what is assumed to be true about the category of women (Zwarteveen, 2006). The research in Nepal on gender in irrigation fits in this picture (Bruins and Heijmans, 1993; Zwarteveen and Neupane, 1996; Koppen *et al*., 2001; Udas, 2002; Ghimire, 2004; Upadhyay, 2004; Udas *et al*., 2014). This thesis does not directly contribute to this body of work, but uses it as context for an inquiry into the other two dimensions of masculinity in irrigation. Research on masculinities in the professional irrigation domain is an emerging field of study (Laurie, 2005; Udas and Zwarteveen, 2010; Ongsakul *et al*., 2012), inspired by a broader interest in feminist studies to unravel the linkages between masculinities, identities and professional cultures (for instance, see Brandt and Haugen, 2005 for the forest sector and Kleif and Faulkner, 2003; Faulkner, 2009a; 2009b for engineering cultures). Research on irrigation expert knowledge, and how it is linked to representations of reality and modernity and the politics of gender, is at best a loosely defined field of study (see Zwarteveen, 2010 for irrigation; Scott, 1998 for state building; Klingensmith, 2007 for dams and river development; Reuss, 2008 for engineering; Law, 2009 for surveys). Being trained as an irrigation professional in Wageningen and sharing a faith in water professionalism and (positivist) irrigation science, and also being inspired by feminist theory, this thesis has been written with two audiences in mind: (1) the 'reflexive engineer' to use a term of Robbins (2007) and readers of literature on water control in irrigation, and (2) feminist scholars and readers of critical interpretative theory in science, development and technology.

1.2 Meeting irrigation engineers and water professionals in India and Nepal

The interest for research on professional cultures in irrigation is not new (Chambers, 1988; Diemer and Slabbers, 1992). In the early 1980s, following a litany of complaints about the poor performance of public irrigation schemes, the critical role of the implementing agency was identified and 'studying the irrigation bureaucracies' became an explicit research objective of policy reform agendas (Coward and Levine, 1987: 14). The question was how to transform public irrigation agencies into more responsive and service-oriented organisations (Korten, 1989). A number of distinct but not readily separable characteristics of irrigation departments surfaced as important for study: (1) an engineering culture of 'building things' (Coward *et al*., 1982: 7), (2) a bureaucratic culture of hierarchy and control, characterized by fixed processes and procedures of public intervention (Coward and Levine, 1987), and (3) an entrenched culture of 'male hegemony' in irrigation bureaucracies (Lynch, 1993: 334). The debate on these cultural characteristics of irrigation departments and the task of transforming engineers into reflexive practitioners came to inspire research from the 1980s onwards, first in the irrigation programme of Cornell University and then in research of the International Irrigation Management Institute (IIMI, now the International Water Management Institute, IWMI) (Diemer and Slabbers, 1992) and also at the IWE group of Wageningen University, under professor Linden Vincent, the promoter of this thesis (see for instance Makwarimba and Vincent, 2004; Vuren and Vincent, 2009). My professional orientation lays with this school of thought in irrigation, concerned with 'making irrigation systems work' and 'turning engineers into reflexive practitioners' (see for instance Vincent, 1995; 2001). With this in mind, I went to India in 2002 for an internship with the IWMI-Tata Water Policy Programme, to study irrigation management 'in the field' and engage with irrigation engineers and water professionals to reflect on 'their' practice (Liebrand, 2003; Talati and Liebrand, 2005). It was during my internship in India that I was introduced to the male-dominated, civil engineering and bureaucratic tradition in irrigation for the first time and that I had my first memorable and joyful encounters with (male) engineers and overseers of an irrigation agency.

This thesis takes these encounters as a start and focusses on irrigation engineers in the government of Nepal, in the Department of Irrigation (DOI). I went to Nepal because the irrigation agencies in South Asia, with their roots in the British-Indian civil engineering tradition, have a particularly strong 'masculine' reputation in the irrigation world

(SaciWaters, 2011; Zwarteveen, 2011).[1] I also have interacted in Wageningen and South Asia with many 'other' professionals in irrigation and water management, from economists and agriculturalists to institutional specialists and social science researchers. The majority of these professionals also are men – a reality that contributes to the masculinity of water professionalism in my view. At the occasional international water conference that I attended – the Annual Partners' Meeting of the IWMI-Tata Water Policy Programme in 2003 in India – I observed the collegial and exclusive networking and the personalized cultures of interaction between different actors, notably of Northern water experts, whose professional performance appeared (to me) to carry strong associations with a masculine identity of Caucasian appearance and 'being tall'. I have also come to see that male domination in irrigation professionalism, particularly in relation to engineering, extends far beyond the boundaries of irrigation departments, into engineering colleges, consultancy firms, construction companies, NGOs, lending agencies and international research organisations, including at the IWE group of Wageningen University. Based on this embodied experience, I have felt uneasy from the start in this thesis about the almost exclusive focus on DOI irrigation engineers and also about a gender politics of North-South development cooperation that is inherently involved in it. In the end, my choice to focus on irrigation engineers in the DOI has been inspired by the knowledge that the water sector in Nepal, like elsewhere in Asia, is an area of expertise that is historically managed as a field of irrigation engineering, especially in relation to the state bureaucracy, and by the received wisdom (and claim of notably Northern researchers) that the bureaucratic tradition in irrigation is the most dominant form of male hegemony in the water sector (Lynch, 1993; Ongsakul *et al*., 2012).

Keeping this in mind, I started my PhD with one personal commitment: to understand and reflect on masculinity as an *intercultural phenomenon* in the broadest sense of the word – not as something that is typical for men in Nepal or particularly distinct for irrigation engineering and technical professionalism in South Asia. I started my study with the realization that the masculinity and expert-status of foreign engineers and water professionals, notably from the North, and I consider myself one of them, embodies a gender hierarchy in which both Northern and South Asian professionals have to position themselves.

1.3 Objectives and research questions

Taking note of the continued major absence of women professionals in irrigation and the disappointing status of mainstreaming gender in development, and exploring how associations between professional performance and masculinities might affect our thinking, this thesis

[1] The IWE group then had a good research network in Nepal through cooperation with Nepal Engineering College (*NEC*). Initially, my research proposals focussed on Sri Lanka and the Philippines because the reform in the state irrigation agencies in these countries in the 1980s served as international models. I secured funding for research in Sri Lanka but decided to go to Nepal because of the then on-going civil war in Sri Lanka.

considers the silence on the masculine subject in irrigation expert thinking, and in development research and policy as an intriguing problem. It is hypothesized that there is something intrinsically masculine about the irrigation and water management profession, both in the North and in Nepal, and the aim is to scrutinize a taken-for-granted association of men with organisational power, authority and expertise in irrigation (cf. Collinson and Hearn, 1996 cited in Zwarteveen, 2008: 111). The research objective, or political project as feminist scholars call it, is to make 'men' visible in irrigation and *make* masculinity a topic of controversy and debate in development – not necessarily to clarify or explain it. It is expected that this adds fresh insights to the gender debate in irrigation and development and helps to create a more reassuring environment for women to perform as professionals in irrigation.

Two central research questions have been formulated for this thesis; one each for the second and third domain of the irrigation world in the classification of Zwarteveen (2008; 2011):

1. What is the (main) roadway for becoming a successful irrigation engineer in the DOI in Nepal, what formal institutions constitute this roadway, how are these institutions gendered and what cultural norms govern the informal milieu of these institutions, how do young students develop agency and desire for professional performance on this roadway, what are the masculinities involved and how can they be made visible?

2. How might masculinities be implicated in irrigation knowledge and water expert thinking, what is the performativity of irrigation knowledge, how do technical representations help to enact professional credibility of irrigation professionals, what associations with masculinities might be involved and how can they be made visible?

Both set of research questions focus on content ('what' masculinities can be seen in irrigation) as well as on method ('how' can masculinities be seen in irrigation). The development of feminist perspectives and analytical diagrams is a pre-requisite for seeing masculinities in irrigation, because the question of content ('what' is seen) is intractably linked to the question of method ('how' it is seen) – a point that is central to feminist scholarship.

1.4 Theoretical perspectives and key concepts

Many of the chapters in this thesis have a conceptual framework itself, reflecting a grounded theory approach that I have adopted in analysing empirical material and writing the thesis. As I explain below, there are many ways to see masculinities in irrigation – there is no scientific truth about masculinities – and I felt inclined to develop an approach that allowed me to test and explore the usefulness of theoretical notions along the way of doing research. This approach may have affected the theoretical coherence of the thesis and the clarity of the argument, but it illustrates that empirical research in irrigation on masculinities is actually very difficult, at least for me, being male and being trained as a water professional myself. I experienced it as an interdisciplinary juggling act of the first order, particularly with consulting many sources and doing many interviews in an attempt to do justice to a diverse range of perspectives – the key premise of both interdisciplinary practice and feminist research (Klein, 1990; 2004; Klein and Newell, 1997: Pryse, 1998; 2000; Reinharz, 2002; Bee, 2003; Lykka, 2004; Robbins, 2007; Mollinga, 2009). This chapter presents the overarching theory and concepts that have informed the thesis writing. It is an analytical framework that can be read as a (new) method to study masculinities in irrigation.

Doing research in irrigation on masculinities requires conceptual insights from a wide range of disciplines. For a start, one needs to have a basic understanding of both mainstream irrigation knowledge and the related ‘normal water resources development paradigm’ as Merrey (2009) calls it, and feminist/women/gender concerns in development studies. Needless to say, both fields itself are deeply interdisciplinary domains of study (see Diemer and Slabbers, 1992; Ertsen, 2005 for a background on irrigation knowledge and Pryse, 1998; 2000 for feminist studies). Historically, the study of irrigation has been a discipline of applied engineering, but in the last three decades, it also has taken up questions from institutional, ecological, social and political perspectives (Molle *et al.*, 2008). Likewise, feminist studies have traditionally been about the subordinate position of women, but now, drawing on post-modern philosophies and other critical perspectives, these include studies on inequalities across ethnic groups and cultural and social borders, and also on men and masculinities (Whitehead and Barrett, 2001). This means, for instance, that a study in irrigation on masculinities is incomplete without consulting anthropological literature on Nepal and this book sometimes goes seemingly far afield of irrigation and water works, into notions of caste and ethnicity, norms of compulsory heterosexual behaviour and the cultural practice of toilet visits in the field. The implication is that I saw no other option than to black-box some of the very interesting and worthwhile theoretical debates both in irrigation and in gender, also on how the engineering profession has analysed itself (Wilson, 2006; 2008; Robbins, 2007), in order to keep my focus on ‘masculinities in irrigation’.

1.4.1 Professional performance as cultural performance

Professional performance, in the broadest sense of the word, is viewed in this thesis *as cultural performance*. The concept of (cultural) performance, and its offshoot performativity, is the conceptual backbone of this thesis. The concept has various academic genealogies and is variously interpreted in a bourgeoning body of literature (see for instance Turner, 1987; Butler, 1999 [1990]; Munro, 1999; Hilgartner, 2000; Latour, 2000; McKenzie, 2001; Conquergood, 2002; Law and Singleton, 2000; Markussen, 2005; Schechner, 2006 [2002]; Rap, 2007; John, 2008; Law, 2009). I have looked particularly, though not exclusively, to the ideas of the British anthropologist Victor Turner (Turner and Turner, 1987; Turner and

Bruner, 1986; Turner, 1987; 2008 [1969]), who is considered one of the founders of contemporary cultural performance theory (John, 2008), and the work of Butler (1999 [1990]) and Law (2009) on performativity.[2] In the process of research, I have come to see their work as particularly applicable for this thesis. It has enabled me to conceptualize linkages between the gender of engineers, professional cultures in irrigation and technical representations in irrigation knowledge in a multiplicity of ways, without having to exclude myself and my professional performance from the writing process. The latter I deem important, because accounts and experiences of masculinity (and femininity) are unavoidably interpretative, situated and partial (Connell, 2005 [1995]).

Taking inspiration from McKenzie (2001), who quotes Turner as well as many others, the metaphor of performance can simultaneously be read as technical performance and cultural performance.[3] The term technical performance and its variations – organisational performance, system performance, staff performance, project performance – are familiar terms in engineering practice and irrigation expert thinking. It usually is defined as follows: to operate efficiently, to work productively, to do something up to a standard, to function as per design, to meet policy targets, to deliver services or to cooperate as a group (cf. Schechner, 2006 [2002]). In contrast, the term cultural performance, its meaning derived from public drama and staged or theatrical performance, has no meaning or application in mainstream irrigation knowledge. Broadly, it can be defined as follows: to show off, to perform behaviour that is expected; to act according to the social norm or to underline an action for those who are watching (cf. Schechner, 2006 [2002]). Cultural performance theory asserts that 'technical' and 'cultural' performance – as I call it – always coincide and mutually constitute professional performance. Professional performance is not just a matter of technical skills and knowledge but also a product of cultural practices of professionals who aim to create credible voices for themselves (Hilgartner, 2000). In this view, irrigation professionalism can be considered as 'public drama' in which irrigation engineers perform 'on stage'.

Cultural performance theory offers a ritual or processual approach to understand 'culture' in the broadest sense of the word. In short, this approach allows to conceptualize professional performance – and the masculinities associated with professional performance – as something that is alive and present, as a phenomenon that is in-composition and open-ended. These ideas go back directly to Turner's theory on the 'anthropology of experience' (Turner and Bruner, 1986) and the 'anthropology of performance' (Turner, 1987). Turner was interested in how people experience their life, how they give meaning to it through rituals and how they re-

[2] Butler (1999 [1990]) refers to Turner in her discussion of performativity (see footnote 71, p.178) while Law (2009) refers to a different body of literature in his discussion of performativity (see footnote 1, p.251).

[3] This is my interpretation. McKenzie (2001) talks about technological, organisational and cultural performance (p.5-12). Other classifications of kinds of performance exist as well (see Schechner, 2006 [2002], p.31).

produce and renew culture in the process. Based on his lifelong work with the Ndembu tribe in Zambia in the 1960s and 70s, he articulated a processual approach to understanding culture rather than seeing cultures as fixed, closed, authentic or primordial (see Turner and Bruner, 1986; Turner, 2008 [1969] for background and discussion). Processes of 'culture in the making', he argued, are best visible in the practice of rituals, symbols and performances, and cultures can better be understood and compared through their rituals, theatres, tales, ballads, epics and operas than through their habits. He argued: 'Cultures are most fully expressed in and made conscious of themselves in their ritual and theatrical performances. (...) A performance is a dialectic of "flow", that is, spontaneous movement in which action and awareness are one, and "reflexivity", in which the central meanings, values and goals of a culture are seen "in action", as they shape and explain behaviour' (Turner in 1980 on a conference on ritual and performance, cited in Schechner, 2006 [2002]: 19).

As the quote above makes clear, the difference for Turner between habits and performances lies in reflexivity. Habits like cooking, childcare and agriculture require daily planning, and entail action and awareness, but not necessarily reflection. He defined reflexivity in two ways. First, reflection means 'expression'. Performances express or symbolize meaning and emotion of culture and experience (Turner and Bruner, 1986). For example, the habit of cooking may not signify any particular aspect of a culture, at least not very visibly, but the performance of offering food and items at a shrine to please the gods are clear expressions of certain beliefs and norms in a society. Second, reflection means 'reconstruction'. Rituals and performances dramatize and cast back the present in an hypothesized past and an anticipated future. In partaking in rituals and performances, compulsory or voluntarily, people learn about their culture and come to embody it. For instance, people perform offerings at a shrine as they have learned, and in doing so, they re-create the performance and make it into new culture; they do so in the present because they believe the gods brought misfortune in the past (hypothesized past) and will bring them prosperity in the future (anticipated future). In this perspective, it can be said that people reconstruct culture by engaging in scripted and staged behaviour – in behaviour that has no single author and is marked off by aesthetic conventions, traditions and styles of decorum. In other words, cultures are re-made in 'twice-behaved' or 'restored behaviour', that is, 'as I have learned' or 'as I am told to do' (Schechner, 2006 [2002]: 34).

Experience – how society is lived by its members or what is considered real – is an important concept in the anthropology of performance. Turner understood experience as disruptions that mark isolable sequences beyond daily life routine, marked by beginnings, middles and endings. Experience is the way in which people tell what is most meaningful about their lives (Turner and Bruner, 1986). Experience can be considered to constitute the smaller and bigger narratives in life, from single rituals like getting a bachelor degree ('being uneducated, getting education and being a graduate') to the whole life cycle ('we get born, we live and we die').

In my view, experience can even be interpreted as a discourse, how cultures present a field of reality as if it were a naturalized system or a logic course of events. For instance, hypothetically saying, when asking irrigation engineers in Nepal what their professional life is about, they might explain and give meaning to their actions in reference to an experience of national development that is marked by beginnings ('Nepal is underdeveloped'), middles ('building projects for a new Nepal') and endings ('a modern Nepal') – an experience that is variously known in Nepal as *bikas* ('development'). Key in studies on cultural performance is to understand what meanings are given to the present and to analyse how those meanings are constructed, reproduced and altered. A study of meaning – the meaning of professional performance and associations with masculinities in irrigation – is based on the assumption that we cannot perceive life outside experience and its expressions. As Turner and Bruner (1986) argue: We can perhaps articulate a critical distinction between 'reality' (whatever may be), 'experience' (how that reality presents itself to the consciousness), and 'expressions' (how individual experience is framed and articulated), but we can never see/observe/feel 'reality' independent of experience; and we can only compare and analyse 'reality' through a study on 'expressions' (p.6). In this view, what is considered 'real' and what is considered to matter is in fact, experience and expressions – the product of cultural performance.

The processual approach of Turner to understand culture has found application far beyond the study of tribal and religious rituals, forming the basis for many contemporary theories of cultural performance (see Schechner, 2006 [2002]; John, 2008 for an overview). I use ideas from this school of thought in two interrelated ways. First, I recognize that cultures are in-composition, open-ended, becoming and that its re-production is dependent upon period appearances, in histories of societies and the lives of individuals, of organized moments of categorical disarray and intense reflexive potential (John, 2008). This idea allows, for instance, to conceptualize rites of passage on the roadway for becoming an irrigation engineer and also, to analyse the meaning of intense and transitional experiences that professionals have undergone in their life. Second, cultural performance allows to conceptualize all human action as a 'continuum' and all artefacts of culture as 'in motion'. In short, everyday life, the repeated enactment of social, professional and gender identities, and every object or thing can be studied *as* performance. Whatever is studied – behaviour, texts, architecture, maps, photos, irrigation structures – is examined for its 'liveliness' and 'performativity'; not as people and actions or artefacts in themselves, but as players in ongoing relationships. This idea allows, for instance, to conceptualize how everyday practices of irrigation engineers and the use of technical representations of knowledge helps to sustain a professional culture in irrigation.

1.4.2 Subjectivity, agency and performativity

In the cultural performance view, irrigation engineers and water professionals only partially act and behave rationally – a view on subjectivity that is also central to feminist theory.

Subjectivity and the subject are here defined as 'selfhood', 'the self' and 'the individual' (Cranny-Francis *et al*., 2003). For this study, the subject models of Foucault (1981) and Butler (1999 [1990]) have been taken as a reference. Their models do not primarily view subjects as 'victims' or as essentially masculine or feminine, and they do not lock the subject in silences and repressions, but focus on the agency that it has within certain structures. These models do 'not allow for either fully autonomous subjectivity or space beyond power from which to act', but suggest that 'agency can transform aspects of material discursive practices and the power relations inherent in them' (Weedon, 2003: 127). For clarification, these subject models reveal the tension in feminist theory in using the concept of agency. Taking irrigation studies on water control as a reference, which rely on theory of Bourdieu (1977), Giddens (1984) and Long (1989; 2001), human agency is usually understood as 'the capacity of an actor to realise at least part of the intended actions through (strategic) interactions in a network of social relationships' (Vincent, 2004: 38); as 'people [that] are active players in creating new social and material environments, even when they have to operate within a context that is only partially of their own making, and with motivations that are only partly conscious' (Mollinga, 2003: 26). These definitions of agency focus on the 'intended', 'strategic' and 'active' capacities of actors, based on the assumption that such (partial) rational capacities can be distinguished from the irrational and 'partly conscious' capacities of actors. In many cases this is actually very difficult and only possible with having some sort of norm or preconceived idea in mind what possibly can constitute the (partial) rational capacities of an actor. The challenge lies in the difficulty to make a distinction between agency and 'habitus' – the acquired dispositions and habituated practices that inform the capabilities of an agent (Bourdieu, 1977). Agency is situated in habitus and ideally, agency needs thus to be analysed together with habitus – not separately, particularly when taking into account that habitus is also about complex embodying structures such as gender and class discrimination in society.

In this context, it is important to iterate that agency in the subject models of Foucault and Butler can entail *any type of action,* from resistance and struggle to conformity and compliance. In the contemporary secular-liberal politics of feminism in the West, and I would say in the politics of development in the West in general, the concept of agency is generally reduced to a synonym for resistance to relations of domination (Bracke, 2008). Hence, 'agency (...) is understood as the capacity to realize one's own interests against the weight of custom, tradition, transcendental will, or other obstacles' (Mahmood, 2001: 206). Such a normative understanding is based on the rational liberal-humanist subject model which holds that people need to become aware to free themselves from irrational oppressive structures, which can be patriarchy or a masculine professional culture in irrigation. This secular-liberal 'doctrine of agency' has become essential to our recognition of 'other' people's humanity (Bracke, 2008). For a critical investigation of masculinity, this view is not very helpful. This can be illustrated by how the West tends to interpret the participation of educated women in conservative religious movements – as victims in an irrational oppressive structure (Hollywood, 2004; Bracke, 2008). However, Mahmood (2001) shows in her study on the Egyptian Islamic revival (1970s-1990s) that the movement required considerable agency of pious women – as agents and not as victims. She describes that many ‘modern Egyptian women’ have turned to wearing the veil following the idea of female modesty or piety as Islamic virtues (p.209). This may appear to be a case of deplorable passivity and docility from a progressive point of view, but she rightly states – following the subject model of Butler – that ‘agentival capacity is entailed not only in those acts that result in (progressive) change but also those that aim toward continuity, stasis and stability’ (Mahmood, 2001: 212).

The example of the Egyptian women who desire to follow Islamic virtues and start wearing the veil, illustrates what Butler (1997) calls the ‘paradox of subjectivation’ – the very process and conditions that secure a subject’s subordination are also means by which he or she becomes a self-conscious identity and agent. This means, for instance, translated to the position of the few female engineers in the DOI, that participation in the professional culture of the agency, in relation to the masculine norms and behavioural culture in the DOI, makes a woman self-conscious about her role and position as a ‘female engineer’. This is perhaps a subject position that allows her to execute job responsibilities, but it also secures here subordination in the organization as a woman. Seeing agency as strategic acts of resistance fails to capture this dynamic, because it disqualifies all interactions of male and female engineers that produce continuity, stasis and stability as acts of agency. Nor does it allow for an analytical understanding why young engineers, both male and female, primarily act to perform up to the norm, and so help sustaining masculinities in irrigation professionalism. The problem is created by the assumption of the universality of desire, the rational-liberal and progressive idea that all people want to be free from relations of subordination, and for women, from structures of male domination (Mahmood, 2001). In practice, however, all forms of desire are socially constructed and gendered, or as Bourdieu (1984 [1979]) would say, the ‘judgement of taste’ is situated in habitus. Thus, to understand the agency of an irrigation engineer and ‘his’ capacity to act and perform successfully in the DOI, it is important to recognize that people can strategize without fully knowing the causes and effect of their actions and also, to contextualize desire in irrigation professionalism in order to understand how engineering graduates acquire the passion of an irrigation engineer.

Cultural performance theory and the concept of performativity offer such a perspective on agency and the development of desire – in two interrelated ways.[4] The first is the notion of ‘performativity’ of Butler (1999 [1990]), who conceptualizes behaviour of subjects as ‘a stylized repetition of acts’. This concept or rather what I take from it – the writing of Butler

[4] For clarification, Turner never talked about agency in the debate on structure.

leaves space for interpretation – captures the idea that individuals (can) act consciously in an independent, free and rational way but do so subconsciously in a staged, dramatized and restored way. Goffman (1959), another key author in contemporary theories of cultural performance, already wrote about this idea. Goffman considered 'life itself as a dramatically enacted thing' (Schechner, 2006 [2002]: 210) and asserted: 'The legitimate performances of everyday life are not "acted" or "put on" in the sense that the performer knows in advance just what he is going to do, and does this solely because of the effect it is likely to have. The expression it is felt he is giving off will be especially "inaccessible" to him. But as in the case of less legitimate performers, the incapacity of the ordinary individual to formulate the movements of his eyes and body does not mean that he will not express himself through these devices in a way that is dramatized and pre-formed in his repertoire of actions. *In short, we act better than we know how*' (my emphasis) (Goffman, 1959: 73-74 cited in Schechner, 2006 [2002]: 208). These ideas and similar interpretations are represented in theories of self-disciplining and self-normalization (Foucault, 1981), a process that describes the 'voluntarily' reproduction of everyday habits of behaviour and practices into unequal power (and gender) relations. In this perspective, subjects develop desire and agency in continuous interaction with their peers and role models; it is through acts of self-normalization that 'individuals gain powerful pleasures from participating in communities of practice, even when this is in other ways disempowering', because '[f]or many the benefits of conformity outweigh those of resistance' (Paechter, 2006: 15).

A second perspective on agency and the development of desire that I take from cultural performance theory, is related to Turner's writing on people's transitional experiences during the liminal phases of rituals, i.e. the practices and experiences of subjects that are bracketed yet connected to everyday life (Turner and Turner, 1978; Turner and Bruner, 1986; Howard-Grenville *et al*., 2011). The liminal phase is the transitional phase of rituals (see Chapter 4 for elaboration). Rituals are defined here as the acknowledged occasions and transitional practices that symbolize and give meaning to the world. In liminal phases of rituals, the key process of learning is undifferentiated and spontaneous behaviour, a process in which the ritual subject experiences *transition* ('going to be') and *potentiality* ('what may be'). In this perspective, subjects develop desire through undergoing intense and emotional experiences in their life, transforming them inwardly, changing them outwardly and invoking in them deep passions and seemingly natural pleasures to perform a new identity. Here, I suggest that it is useful to think along the lines of three concepts: (1) 'communitas' to understand the structuring of friendship and brotherhood (Turner and Turner, 1978); (2) 'catharsis' to capture the emotional transition of the self (Boal, 2002 [1974]); and (3) 'cathexis' to analyse the confirmation or re-aligning of passion onto objects and sexual desires onto particular genders (Turner, 1987; Connell, 2005 [1995]). These concepts are elaborated in Chapter 4.

In both perspectives – '(self) normalization' and 'transitional performance' as I call them – I interpret 'desire', 'passion' and 'pleasures' broadly, referring to all possible psychological functions of agency (e.g. volition, affection, cognition, motivation). Both perspectives are interrelated in the sense that they offer a processual view on agency; how subjects *develop* and *enact* agency in a stylized repetition of acts or through undergoing intense transitions. The view of (self) normalization has received most attention in social science and forms the basis for the analysis of subjectivity and agency in this thesis. The view of transitional performance on subjectivity and agency has received much less attention in social science and here, the focus is on thinking through how it might work for professionals in irrigation.

1.4.3 Gender, masculinities and femininities

Gender refers to the social relations between men and women and should not be confused with biological sex. The concept of gender was developed in the 1970s to make a distinction between nature and culture. It was meant to contest the idea that social relations between men and women can be explained by sexual differences (see Zwarteveen, 2006, p.32-35 for background reading). It is true that gender relations exist everywhere in the world but that does not make them universal; they take different shapes and forms across the globe, and they change over time. Generally, gender differences are visible in three ways: symbolism, structure and identity (Harding, 1986; see also Zwarteveen, 2008). First, gender differences are visible in assigning dualistic gender metaphors to perceived dichotomies that rarely have anything to do with sex differences (gendered symbolism). Second, as a consequence of appealing to gender dualisms, gender differences are visible in the division of social activities between different groups of humans (gender structure) and third, gender differences are a form of socially constructed individual identity that is imperfectly correlated with sex differences (individual gender identities). Taken together, these dimensions of gender produce norms or expectations that constrain and inspire behavioural practices of men and women, though they do not determine them. It is worth noting that people are often very partially aware of these norms and perceive their behaviour as biological and natural – a view that is propagated in science by evolutionary psychology and other Darwinian explanations for the state of gender relations (Whitehead and Barrett, 2001: 10-11). Gender theory rejects the view of essentialist, pre-historic male and female behaviour, and posits instead that every society has normative (gender) standards which exercise greater or lesser pressures for conformity.

The concept of gender, as described above, has been very useful for feminist studies but also has its limitations. For a start, the concept itself does not transcend the dichotomy between nature and culture (see Butler, 1999 [1990] for elaborations). As described, the concept came into use as a way of separating ideas about social roles from those of anatomical sex, but 'gender' is often used as a way of classifying phenomena that are effectively treated as sexual differences, while still giving a nod to some idea that they are socially constructed (Paechter, 2003a: 69-70). In the meantime, most feminist work has come to discuss gender identities as multiple and shifting. With this in mind, Paechter (2003a) makes an informed plea to abandon the concept of gender for a while, and instead talk of masculinities and femininities – if only to see in what ways this affects our thinking. Furthermore, gender relations are not stable but change over time, a point acknowledged in gender studies from the start but also difficult to grasp. Paechter (2003a; 2003b; 2006) reiterates that gender ought not to be construed as a stable identity or locus of agency from which various acts follow, but as identities which are tenuously constructed through time – an argument for a processual understanding of gender. Following Butler, she argues for the conception of gender as a social temporality, performed in an exterior space through 'a stylized repetition of acts' (Paechter, 2003a: 69). In plain language, performativity means here that we should talk about 'gender performances' as masculine and feminine identities which establish, develop and disappear over time – not 'gender roles' as fixed repertoires of male and female behaviour.

In assuming that gender is performative, I acknowledge that there are many masculinities and femininities – many genders both for men and women – enacted variously by different people and by the same people at different times, influenced by the body, but not tied to it, and related to sexuality but not correlated with it (Peachter, 2003a: 69). It also acknowledges that people act upon ideas about what they think constitutes masculine or feminine behaviour, 'restoring' or 'twice-behaving' those ideas through their own behaviour and by assigning them to the behavioural practices of other people (Schechner, 2003 [1988]; 2006 [2002]). In this view, masculinities and femininities are 'performed' to an audience like in a theatre play; following a clear script, but never following the script in exactly the same way, re-making gender relations in the act of performance, like actors in a staged rehearsal who always improvise in some degree to make it work. With this in mind, Paechter proposes to see performances of masculinities and femininities as 'communities of practice' (COP). The concept of COP denotes a relatively coherent group of people or environment in which learning takes place through social participation (see Lave and Wenger, 1991; Wenger, 1998 for background reading). A COP can be considered to embody the stage and audience for an actor, the place where subjects learn about legitimate norms of behaviour and practice. It constitutes the environment in which people (can) become 'normal' through interaction and have the opportunity to acquire a 'gender authentic' performance – a term coined by Faulkner (2009b) in relation to engineering cultures. She describes that 'engineering and pleasure in technology are (felt and perceived to be) "gender authentic" options for men and "gender inauthentic" options for women' (p.172). When conceptualizing performances of masculinities and femininities as COPs, the process through which subjects acquire gender identities is through self-normalization, be it in the family sphere, at school or in a job.

If performances of masculinity (in irrigation) are so pervasive, how can they be defined? This is not an easy question and one that remains central to the study of masculinities (Kimmel, 1987; Gilmore, 1990; Bourdieu, 1996; Whitehead and Barrett, 2001; Cleaver, 2002; Connell, 2005 [1995]). Broadly, there are four strategies for defining masculinity: essentialist, positivist, normative and semiotic definitions (Connell, 2001: 31-34 for an overview of these strategies). Essentialist, positivist and normative definitions are not very useful because they take away the possibility of critical inquiry into masculinity – they presuppose an essence or standard of true maleness, or define as masculine all that-men-empirically-do. In contrast, following the method of structural linguistics, semiotic approaches define masculinity through a system of symbolic difference in which masculinities and femininities are contrasted. In this approach, masculinity is, in effect, defined as not-femininity (Connell, 2001: 33). This definition of masculinity has been very effective in cultural analysis. It escapes the arbitrariness of essentialism and the paradoxes of positivist and normative definitions. However, it also has its shortcomings. As mentioned, gender is more than symbolism, it also operates at the level of structure and identity (Harding, 1986), and masculinities can only arise in a system of gender relations (Connell, 2001). Therefore, Connell (2005 [1995]) makes an influential plea to study masculinity as follows: 'Rather than attempting to define masculinity as an object (a natural character type, a behavioural average, a norm), we need to focus on the processes and relationships through which men and women conduct gendered lives. "Masculinity", to the extent the term can be briefly defined at all, is simultaneously a place in gender relations, the practices through which men and women engage that place in gender, and the effects of these practices in bodily experience, personality and culture' (p.71). With this definition in mind, it is possible to understand (performances of) masculinity as those practices and ways of being that serve to validate the masculine's subject's sense of itself as male/boy/man (Whitehead, 2002: 5), and it allows to study masculinities as particular COPs or 'gender projects' *in motion* (Connell, 2005 [1995]: 72), re-configuring practices *through performance* with the effect that places or (professional) positions associated with certain masculine and feminine identities are restored or transformed in the gender structure.

However, it remains ambiguous to talk about 'masculinity' (and 'masculinities'). I list the ambiguities here, in acknowledgement, not for debate. First, masculinities and femininities are inherently relational, meaning that masculinities can hardly be studied as a separate topic of interest, apart from femininities and the structure of gender relations (Whitehead and Barrett, 2001). Second, all societies have cultural accounts of gender, but not all have the concept of masculinity (Connell, 2005 [1995]: 67). Speaking about masculinity is 'doing gender' in a culturally specific way. In an intercultural context, it basically tells more about the researcher and the practice of gender in 'his' society (about me and the Netherlands), than for instance, about irrigation engineers in Nepal and the practice of gender in 'their' society. As Gilmore (1990) writes, images of masculinity in South Asia are extremely diverse, probably more varied than anywhere else in the world (p.175), and the indeterminacy of Hindu gender ideas is revealed, for instance, in Hindu cosmology, which is feminine to an 'extent rarely found' in other civilizations (quoting Kakar, 1981: 110) (p.179). Put differently, all languages used in the production of this thesis have a word for manhood ('masculinity' in English, 'mannelijkheid' in Dutch and 'purusathan' in Nepalese), but this does not imply that they mean the same thing, nor that they can be equated, for instance, with the Spanish meaning of machismo (Gilmore, 1990). In practice, however, the situated meanings of 'masculinity' easily get lost in translation. Third, the concept of masculinity is a recent historical product in Europe itself. Before the eighteenth century, women were regarded as different from men in the sense of incomplete or inferior examples of the same character – not as bearers of qualitatively different characters; a conception that came with the bourgeois ideology of 'separate spheres' in the nineteenth century (Connell, 2005 [1995]: 68). Elsewhere, histories of gender (and masculinity) are likely to have evolved differently. Fourth, it follows from these points, that the concept of masculinity itself, like gender, has trouble to transcend the (Western) modernist bedrock of gender thinking – the Cartesian sex-gender dichotomy.

These ambiguities are a reminder that a study on 'masculinities', particularly when done in an intercultural context, should be as specific as possible about performances of masculinity that are described and the perspective from which it is done. I take inspiration here from Harding's (1991) and Latour's (2000) argument on objectivity. Harding (1991) pleads for a 'strong objectivity', an objectivity 'that includes the perspective on research from the standpoint of the research subject' (Pryse, 1998: 16), and Latour (2000) proposes to conduct research in a way that it can be extensively objected to (Boelens, 2008: 24-25). Both concepts of objectivity hold that the research perspective (of the researcher) must be clearly articulated and that findings need to be described in as situated a manner as possible. Their concepts of objectivity also imply that research on masculinities is meaningless if I do not reflect on my own position and masculinity – as a Dutch, male water professional doing research in Nepal.

1.4.4 Intersectionality, class, caste and ethnicity

As a structure of social practice, gender is unavoidably involved with other social structures and cultural practices (Connell, 2005 [1995]: 75). Simply put, gender is not only about men and women, but also about any other 'intersecting' differences such as class, caste, ethnicity, sexuality and age (Crenshaw, 2000; McCall, 2005). There are now strong calls that 'feminism should be intersectional', which means that researchers should 'be aware that gender, in isolation from other important axes of signification, does not adequately explain the world' (Wekker, 2004: 496). The concept of intersectionality has proven its worth in addressing the 'triple oppression' of black women: gender, race and class (Yuval-Davis, 2006: 195) and was critical in bringing to the fore questions of 'racialization' in black US feminist work (Wekker, 2004; Davis, 2008). Since then, the concept of intersectionality is considered to address 'the most central theoretical and normative concern within feminist scholarship: namely the acknowledgement of differences among women' (Davis, 2008: 70). For feminist research, it is a 'handy catchall phrase' to make visible multiple positionings that constitute everyday life and power relations (Phoenix and Pattynama, 2006: 187). In this thesis, I use the concept to study how masculinities intersect with social divisions like class, caste and ethnicity.

Also this concept has limitations that need mentioning. First, the concept is meant to acknowledge differences *among* women (and *among* men), but it is impossible to take into account all the differences that are significant at any given moment – the list is potentially boundless (Yuval-Davis, 2006). Class, caste and ethnicity clearly need to be taken into account for a study in Nepal on masculinities (Höfer, 2004 [1979]; Gellner *et al.*, 2008 [1997]), but differences of age, being abled/disabled, sexual preference or residence in rural/urban areas – to name a few – also function as axes of signification (Tamang, 2000; 2002). The trouble is to prioritize 'significant' differences (while neglecting the other). Second, the challenge of 'seeing' (and 'selecting') differences for a study of intersectionality becomes 'more obvious when trying to apply it to empirical analysis' (Ludvig, 2006: 246). The risk is that an analysis of intersectionality adopts a 'categorical approach' (McCall, 2005: 1790), or what others have called an approach of 'systematic intersectionality' (Phoenix and Pattynama, 2006: 188). Reducing masculinities and femininities into categories of class, caste and ethnicity, for instance, is problematic because 'social divisions are irreducible to other social divisions' (Yuval-Davis, 2006: 195). More specifically, using 'existing' social divisions in feminist research is problematic because 'such boundaries are naturalized by specific hegemonic political projects in order to exclude and marginalize certain people' (Yuval-Davis, 2006: 205). This is particularly apparent when talking about caste and ethnic categories in Nepal (see below for elaboration). The third point is related to the ambiguity of a politics of intersectionality when it is applied to all inequalities. Verloo (2006) acknowledges that 'power struggles between various inequalities will always be present' in an analysis of intersectionality (p.224). The apparent danger is that work on intersectionality results in 'identity politics' and reinforces the positional boundaries between women (and between men) rather than making these more fluid (see Pryse, 2000, p.108 for this an elaboration of this argument). The challenge is to adopt a 'constructionist' or 'anti-categorical' approach to intersectionality and analyse how axes of signification define particular COPs as gender projects in the gender structure (McCall, 2005; Phoenix and Pattynama, 2006).

Three axes of signification stand out as particularly relevant for a study in Nepal on masculinities: class, caste and ethnicity. The reason to focus on these ones is fairly straightforward and explained below. In relation to professionalism in irrigation, critical intersections can be identified on the axes of nationality, professional discipline and institutional affiliation. These intersections are discussed in the analytical chapters (particularly in Chapter 6).

In South Asia and elsewhere, '[t]he most significant source of power is no doubt related to class or to the control over means of production such as land and industry' (Mohanty, 2004: 20). With class, I mean a 'political economy category' referring to a social group embodying certain relations of production *and* power – not just an income group or a simple economic category (Mohanty, 2004: 25). In this view, the ruling class or classes are the owners of the means of production, defined here as land, factories, technology, knowledge and other forms of capital; and the ruled are those who are engaged in labour and are subject to exploitation by the owners. This definition of class is based on the Marxist method of dialectical materialism to the understanding of history. In Nepal, the development of class relations is rooted in the agrarian structure of the country (Regmi, 1999 [1972]; 1999 [1977]), and how Nepal has been inserted in the late capitalist economy since the 1950s via bikas ('development') (Tamang, 2002). Historically, Nepal's political economy has always been about land and agriculture. 'Land (...) represented the principal form of wealth, the principal symbol of status, and the principal source of economic and political power. Ownership of land has meant control over a vital factor of production and therefore a position of prestige, affluence, and power' (Regmi, 1999 [1977]: 1). Saliently, control over irrigation and water flows played a not insignificant role in this; the land tenure system in Nepal has its roots in irrigation (e.g. high tax imposed on irrigated land), regulated by a feudal elite and landlords (Uptreti, 2004; see Regmi, 1999 [1977], p.132 for classifications of irrigated land).

Class relations intersect with caste and ethnic relations in Nepal in substantial ways. In the period 1768-1951, and in many parts of Nepal much earlier, the king was established as the divine ruler and ultimate owner of the land, and a pattern of property and administrative relations developed consistent with the principle of state ownership through royal charters (see Regmi, 1999 [1972]; 1999 [1977] for a history of land tenure systems in Nepal). Those liable for land grants through royal charters came from a select group of the Hindu elites and rulers loyal to the king. Grants were made exclusively in favour of priests, teachers at the court, (high) ranking soldiers and members of the nobility, and were restricted to a few select caste groups in society and tended to be concentrated for the most part among Brahmans, Chhetris and other ethnic groups of Indo-Aryan origin to the exclusion of Mongoloid and autochthonous groups such as the Gurung, Magar, Limbu and Tamang. An exception was the (indigenous) Newar community in the Kathmandu valley (Regmi, 1999 [1977]; see below for an explanation of these caste and ethnic categories). Such royal charters had a critical role in the emergence of class relations between landlords-cum-administrators (the rulers) and the peasantry (the ruled). It can be said that the resultant pattern of land access, in spite of land reform policies, continuous to explain the class structure in Nepal which is characterized by a skewed pattern of land distribution and a large peasantry (Shrestha, 2008; see Alden-Wily *et al*., 2009 for the distribution of rural landholdings in Nepal between 1961 and 2002).

Irrigation engineers and water planners in the DOI can be considered descendants of the class of landlords-cum-administrators. More specifically, officials in the Rana government (1846-1951) came from some two to three hundred families, known as the *bhardar* class or the ‘client families’ (Shumshere, 1971). These families had consolidated their position through land grants in Nepal and were appointed as district governors (*bada hakim*). After the fall of the Rana government in 1951, members of the bhardar class came to dominate the ranks of education, the civil service and employment in foreign aid projects. Today, descendants of the bhardar class are variously known in Nepal as ‘the educated Hindu high caste’ (Bista, 1991: 113), ‘the Nepalese intelligentsia’ (Whelpton *et al*., 2008: xix), ‘the Parbatiya elite groups’ (Whelpton, 2008 [1997]: 49) or more generally, in regard to caste, ‘the Bahuns’, ‘the Chhetris’ and ‘the Shresthas’ (Newar) (Gellner *et al*., 2008 [1997]), and in relation to gender, as the ‘Hindu male state elite’ (Dahal, 1995 cited in Tamang, 2002: 315). Broadly, it can be said that the bhardar class and the old sub-class of lower level revenue collector and subordinate military officials, have developed into a ‘high class’ and ‘middle class’ in Nepal. The high class include ‘the very rich people around the palace [now the central government]’ (Whelpton, 2008 [1997]: 39) and the middle class constitutes a broad but also a relatively small category of people that has access to (higher) education and employment in the mainly Kathmandu-based, public and private sector. Both classes (still) have control over (some) land in the valley and elsewhere in Nepal or have turned their economic (land) base into real estate and other forms of property. Irrigation engineers and water professionals in Nepal are members of these high or middle classes – terms that I use throughout the thesis.

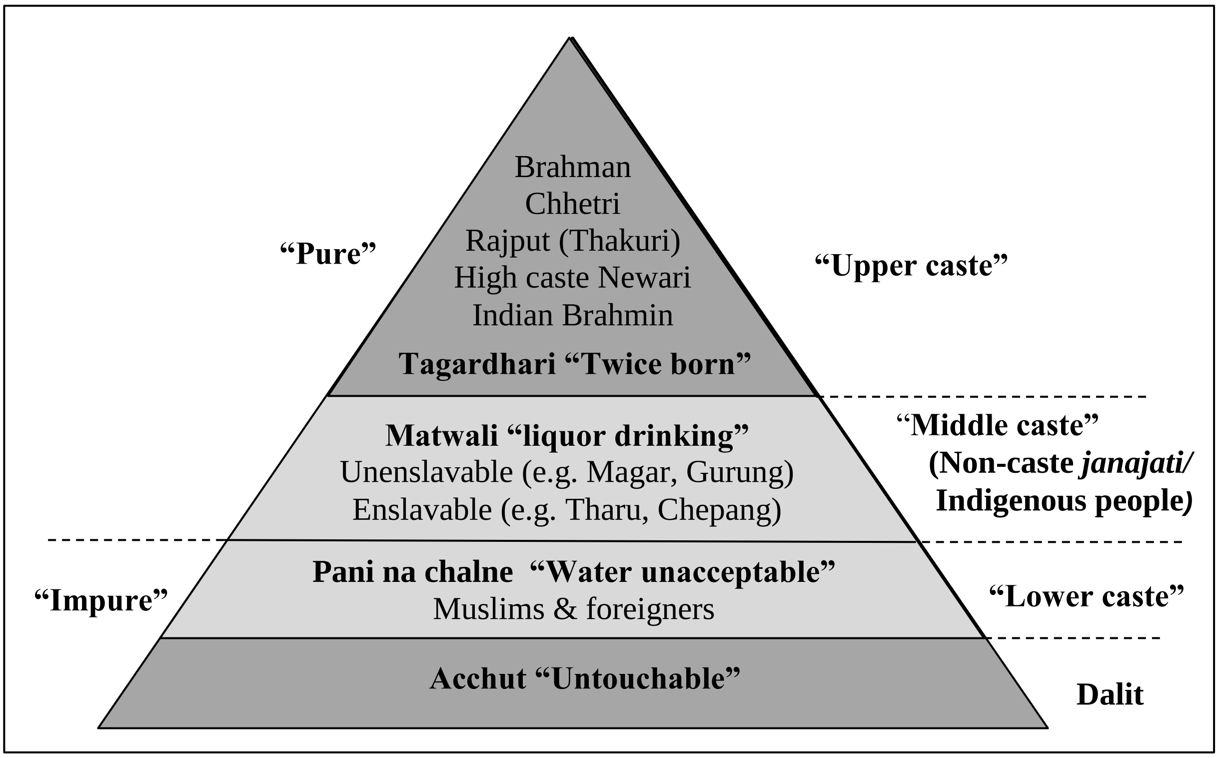
The appropriate term in Nepal for caste is *jaat* as caste, ethnic and tribal origin are subsumed under this term (Guneratne, 1994; Höfer, 2004 [1979]; Gellner *et al*., 2008 [1997]). This makes caste in Nepal (*jaat*) itself an intersecting category of caste, ethnicity and religion (*dharma*), as caste is derived from Hinduism (Mohanty, 2004). For clarification, Hinduism in turn is applied to a range of religious practices and it did not understand itself as just one religion until recently (Michaels, 2008 [1997]). In Nepal, Hinduism includes forms of shamanism as well as Brahmanism, the version of Hinduism brought from India, and Hinduism in its liberal form conceives Buddhism as a branch within it (Bista, 1991: 29-30). Formally, caste-based discrimination was abolished in Nepal in 1963, but caste and ethnicity still function as axes of signification (DFID/WB, 2006). With the end of the Panchayat era, the government began generating data on caste and ethnicity in the population census of 1991, and these data play a significant role in openly ethnic movements to resist state policies (Gellner, 2008b).

In the context of South Asia, caste is generally understood as 'a social group placed in a hierarchical order derived from certain Hindu cultural prescriptions' (Mohanty, 2004: 33). Gaasbeek (2010) rightly points out that caste is a controversial and often rather embarrassing topic that has long been the 'central symbol for India' and is an obsession for Indian anthropology, history and literature alike (Dirks, 2008: 3 quoted at p.85). This is also true for Nepal and Westernized investigators have often singled out caste – above class – as being at the base of many of Nepal's developmental difficulties (Bista, 1991: 2-3). Illustratively, the Department for International Development (DFID) and the World Bank (WB) in partnership with the National Planning Commission (NPC) started in 2001 the 'Gender and Social Exclusion Assessment' (GSEA), a nation-wide study on individual and group access to 'assets, capabilities and voice' based on socially-defined identity, examining the 'three interlocking institutions' of gender, caste and ethnicity – not class (DFID/WB, 2006). The somewhat curious attention for caste in Nepal can perhaps be explained by the observation that social interaction regulated by a Hindu caste system is 'a problem for the conceptual apparatus of Western social sciences' (Gellner, 2008a [1997]: 25). The problem does not lie in the emphasis on hierarchy over egalitarianism, nor that Hinduism requires hierarchically arranged sub-communities which we call castes: 'The real problem (...) is the great *diversity* of imagined communities – different sorts of caste, sect, tribe and others – it contains within it, all coexisting and competing' (emphasis original) (Gellner, 2008a [1997]: 25).

The historical caste structure and contemporary ethnic divisions in Nepal are presented in Figure 1.1 and 1.2. Figure 1.1 shows the caste pyramid as it was systematized in the *Muluki Ain* of 1854, the first civil code of Nepal (Höfer, 2004 [1979]; Whelpton, 2005). Figure 1.2 presents the caste and ethnic divisions in Nepal, derived from the 2001 population census which listed 103 social groups, based on caste, ethnicity, religion and language. For the purpose of analysis, the above mentioned GSEA assessment organised the 103 groups into 10 major categories (see DFID/WB, 2006 for a background). The majority of irrigation engineers and water planners in the DOI – and other members of the Nepalese intelligentsia – have an 'upper caste' background and are member of the Bahun, Chhetri or Newar (ethnic) communities, which comprise about 37% of the population in Nepal.

The meaning of the caste and ethnic categories in Figure 1.1 and 1.2 require some explanation, because they intersect in critical ways with gender, class and state control (and nationalism). In regard to the latter, preserving the Hindu (caste) status of Nepal continues to be seen by many members of the Nepalese intelligentsia as related to state control and national identity in complex ways – also by people from a non-Bahun background (Bista, 1991; Gellner *et al*., 2008 [1997]). Historically, the propagation of a caste-based moral order in Nepal was importantly a political project – not a religious project. There is no other country in South Asia that validated caste by means of a national law code, enforced by the state. The remuneration of caste groups in India, for instance, was made by British-Indian administrators directly from the field, but in Nepal, such a dossier derives straight from an official state document (Sharma, 2004: xxiii). This makes the caste system in Nepal unique. The *Muluki Ain* preserved Nepal as a particularly conservative Hindu society, deep into the 1960s, but also made it different from the orthodox caste societies found in India as it was partially a projection 'from above' (Höfer, 2004 [1979]). In Nepal, the caste system embodied thus an all-encompassing national hierarchical ranking, one that also included such non-caste aliens as Muslims and foreigners, designating them a caste as well (Sharma, 2004: xvi). The *Muluki Ain* provided an image of Nepal as a homogenously constituted society by defining a specific Nepalese 'national' caste hierarchy – an image that informs national identity to date and grants status to the Bahun, Chhetri and Newar administrators who control the government.

Figure 1.1: The Nepal caste pyramid

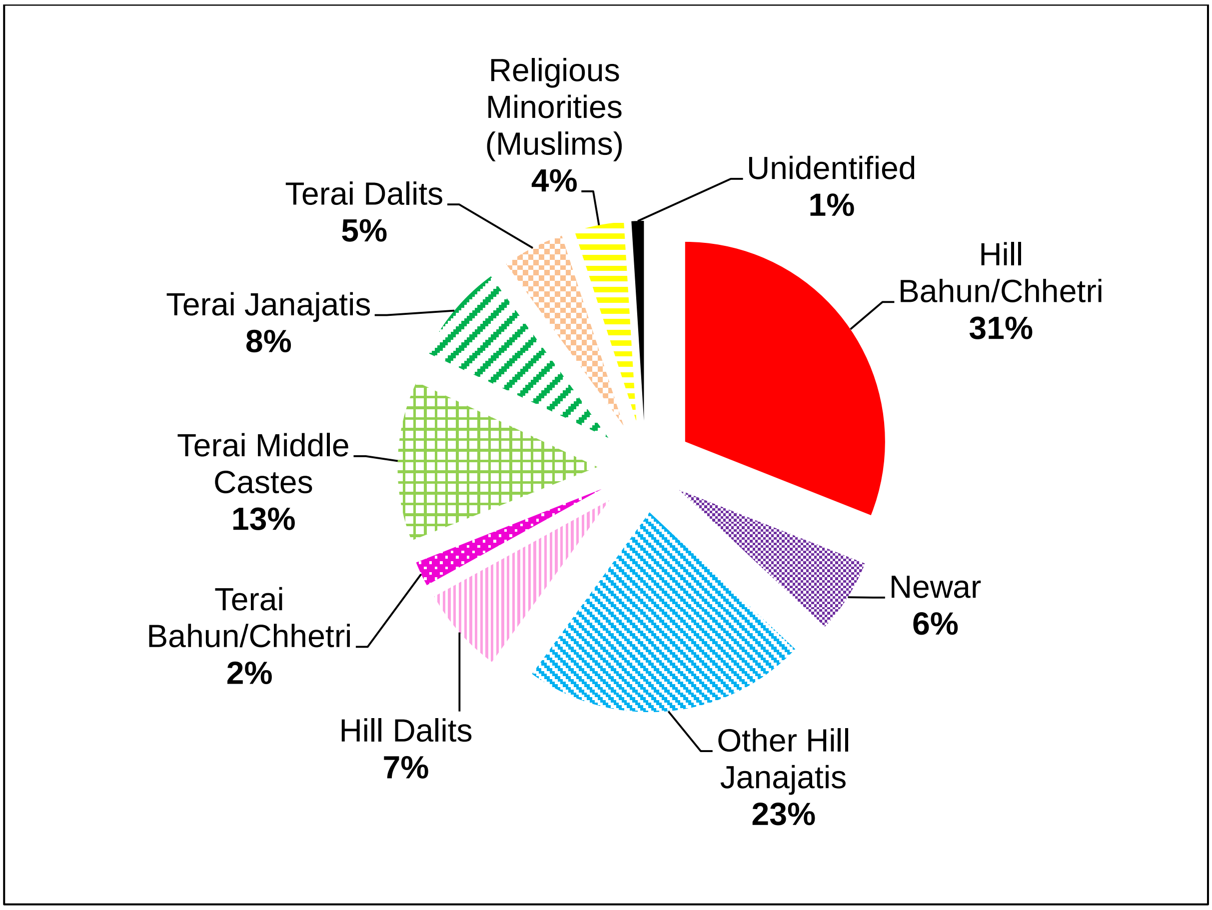


Source: Adapted from DFID/WB, 2006, p.6

The caste system has continued to legitimize the class system in Nepal, long after it was formally abolished (Bista, 1991). Not surprisingly, the majority of DOI irrigation engineers to date come from the high and middle classes *and* have an 'upper caste' identity. Historically, the caste system came into force to legitimize the power of a new class of Gorkhali rulers (Parbatiya) who formed the ethnic backbone of the new state (Ghorkali is the foundational language of Nepalese) (Gellner, 2008a [1997]). In the Gorkha caste system the priestly Brahmans (Bahuns) came first, the warrior caste, the Kshatriyas (Chhetris) second, the Vaishya (merchants, agriculturalists) third and the Sudras (servants, labourers) fourth.

Beneath these castes came occupational and artisan groups, considered ‘impure’ and ‘untouchable’ (Gellner, 2008a [1997]). These groups now call themselves the Dalits (DFID/WB, 2006). This caste hierarchy was simultaneously a class hierarchy. As mentioned already, only members of the Bahun and Chhetri castes were liable for royal land grants. The caste system became more complex in the *Muluki Ain* when a set of middle castes was invented to accommodate indigenous (Hindu and non-Hindu) groups of Mongloid origin. These groups were classified as Matwali (‘liquor drinkers’) and sub-divided into ‘unenslaveable’ and ‘enslaveable’ ranks. Also here, the exploitative class dimensions of the caste hierarchy are apparent. Today, the ‘old’ categories of the Matwali comprise the ‘Adivasi Janajatis’ (indigenous nationalities).

Figure 1.2: The population by caste and ethnicity in Nepal



Source: Adapted from DFID/WB, 2006, p.18

These categories of caste continue to inform the ‘mapping’ of Nepal into social categories, legitimizing and intersecting with class relations in complex ways. The number of social groups and categories in Figure 1.2 appear to stand in isolation to the ‘old’ *Muluki Ain* categories in Figure 1.1, but this is not the case. The Bahun and Chhetri (B/C, upper caste Parbatiya) continue to see themselves as a distinct group and so do the (ethnic) Newar of the Kathmandu valley. Other autochthonous groups are still presented as indigenous people (Hill and Terai Janajatis) and the Hindu castes of the Terai and Muslims come out as separate categories, occasionally known in Nepal as the Madhesi ('Indians', Madhesh means India). To date, upper-caste Parbatiya (B/C) and Newar Hindus control the government, universities and employment in the Kathmandu valley, while upper-caste Hindu (and Muslim) Madhesi traditionally have no role in these institutions. An exception is the engineering sector in Nepal which always has been recognized as a field of employment that is also accessible for Madhesi. This is also visible in the ethnic composition of staff in the DOI (see Chapter 3).

Needless to say perhaps, caste and ethnicity also intersect with gender and norms of sexuality. The *Muluki Ain* was obsessed in dealing with gender and sexual relations between men and women among caste and age groups (Höfer, 2004 [1979]), and today, caste and its cultural attendants continues to propagate a culture of compulsory heterosexuality in a patriarchal gender ideology which strongly favours men (Tamang, 2000). The institutional expansion of the government during the Panchayat era (1961-1990), buttressed by foreign aid, allowed the Hindu male state elite to embark on an ambitious project of national integration and create a single national culture based on Hindu norms. The legal code promulgated by king Mahendra in 1963 – the 'new' *Muluki Ain* – introduced 'the concept of a single system of family law, and by implication, a single family form, for the whole country' (Gilbert 1992: 737 cited in Tamang, 2000: 136). For the invention and standardization of 'the Nepali family', the Brahman-Chhetri form was taken as a model. Within the Hindu template, women's roles are restricted to childbearing and rearing within the private home as a norm with men primarily defined as participating in the political and economic spheres of the public (Tamang, 2000: 137). The predominant theme for Bahun and Chhetri women is duty and obedience, and each (female) individual is ranked according to the principles of male superiority and respect for age. The other theme is the sacredness of consanguine women, whereby female ranks over male and youth age (see Bennett, 2005 [1983]). The social and sexual reputation of a women (*ijjat*) is also the currency of men and needs to be secured and protected, her dignity being an issue of honour and family reputation (Tamang, 2003). The propagation of these norms by the state encouraged the development of separate gendered spheres of the feminine domestic realm of the private and the masculine realm of the public (Tamang, 2000: 127). Women became more closely associated with their bodies as familial ideology, normalizing the view of women as 'naturally' as wives and mothers. Through the re-structuring of state-family, husband-wife, parent-children relations, the state intensified individualistic norms and undermined the authority of the husbands and fathers while strengthening state control over the lives of women to ensure they met state envisioned child-rearing obligations – a shift from 'family patriarchy' to 'state patriarchy' (Tamang, 2000). In this context, the primary duty of high-class, upper-caste Hindu women especially – and some of these women are DOI engineers in Nepal – is to safeguard their social status of acting pure and chaste.

Under transformations of the Nepalese state and the growth of the capitalist economy, the interfaces between gender, class, caste and ethnicity in Nepal are reworked in complex ways – the position of irrigation engineers in the DOI is one such example. To capture the legitimate norms of behaviour and practice that DOI irrigation engineers learn about (and negotiate) as a result of these intersections, both in the family-society sphere and in the professional sphere, I conceptualize the national elite of Nepal as a COP. In using the term 'COP', I denote that the COP of the National Elite – as I call it – is simultaneously a COP of masculinities and femininities. Irrigation engineers, so to speak, participate in both COPs to achieve a legitimate, proper, successful and gender authentic professional performance in the DOI.

1.4.5 Hegemonic masculinity and norms of Elite Manhood

In a study on masculinities, it is important to keep in mind that we are not talking about curious, anthropological identities or the traditional folklore of a society. Gender identities, masculinities and femininities are deeply relational and hierarchical, historically shaped and functioning as culturally normative, political and power-loaded practices (Connell and Messerschmidt, 2005; Potschky, 2008). Almost everywhere in the world, activities dominated by men (and what is seen as masculine) are valued higher than activities dominated by women (and what is seen as feminine). Especially in patriarchal gender orders, gender practices constitute difference as dominance – as unavoidably hierarchical (Connell, 2005 [1995]). The difference-as-dominance pattern underpins every institution and all forms of social organization, at least of those in the patriarchal cultures of Europe and America (Connell, 2001). In this pattern, gender hierarchies function as an important social practice to secure power and control. To capture this dynamic, Connell (2005 [1995]) talks about 'hegemonic masculinity'; the idea that masculinities (and femininities) interact in a (gender) system of oppression and exclusion. Following Gramsci's definition of 'hegemony' which means ascendancy through culture, institutions, and persuasion, 'hegemonic masculinity' is defined as a gender hierarchy, a norm that implies the most honoured way of being a man, a dominant pattern to which all men and women have to position themselves.

The principle of hegemony is that 'at any given time [and any given space], one form of masculinity rather than others is culturally exalted' (Connell, 2005 [1995]: 77). For example, hypothetically speaking, the behaviour of a male Bahun farmer at the local level, in relation to the behaviour of a female Bahun farmer and a male Tharu farmer (an indigenous nationality in the Terai), may present a norm of manhood that is most honourable and hegemonic at the village level. However, when a member of the COP of the National Elite – an irrigation engineer of the DOI for instance – visits a village to discuss a project, 'his' behaviour and performance of masculinity may be seen as hegemonic and most honourable. The same dynamic can be considered to occur when a Western irrigation professional flies to Nepal to meet engineers of the DOI; a performance of Westernized masculinity may be seen as the more universal and most hegemonic form of masculinity in Nepal. The principle of hegemony is that all these (hypothetical) performances relate to each other in a gender hierarchy or gender structure. The authoritative norm in these interactions is hegemonic masculinity. To iterate, the dynamic of hegemony is often not openly violent or oppressive. On the contrary, it tends to operate as ‘normal’ and all-persuasive, much like a Foucauldian type of power. The source and working of hegemony remain hidden in analogy with the watcher in the panoptic prison whose controlling techniques importantly depends on his own visibility (Zwarteveen, 2008). Hegemonic masculinity importantly relies on self-normalization.

The concept of hegemonic masculinity must be used with care. Hegemony suggests an ideology that legitimizes the global subordination of women to men. If so, it means basically the same as patriarchy, a concept that is analytically not very precise because there is little agreement at which level it operates (e.g. system, social relations, individual) (Zwarteveen, 2006: 71). Connell (2005 [1995]) iterates that ‘there is no masculine entity whose occurrence in all societies we can generalize about’ (p.43). I take from this that hegemonic masculinity is not a given structure of patriarchy but rather an ever-changing gender hierarchy in which performances of masculinity are nurtured as ‘strategic responses’ to ‘a given situation’, resulting in a pattern of practices that allows men’s dominance over women to continue. The terms ‘strategic response’ and ‘given situation’ have a particular meaning here. Gender orders constantly face ‘crisis tendencies’ – a term that Connell (2005 [1995]) borrows from Jürgen Habermas (p.84). The concept of crisis tendency needs to be distinguished from the colloquial sense in which people speak of a ‘crisis of masculinity’ (Whitehead and Barrett, 2001). Nor does it mean that gender orders are always in crisis. Crisis tendencies hint at the *potential* disruptions and transitions in the practice of gender, entailing threats or opportunities that require a constant flow of ‘strategic responses’ or ‘gender projects’ to strengthen, restore or preserve a position of (hegemonic) masculinity. Such given situations or crisis tendencies may emerge, for instance, as a result of new policies or budget re-allocations, granting or taking away the mandate of irrigation engineers, or as a result of irrigation programmes or project failures, boosting or damaging the (cultural) reputation of government officials.

In this view, hegemonic masculinity functions as a nurtured strategy of those who benefit from the norm and the associated practices. As an example of such a nurtured strategy, Connell (2005 [1995]) mentions the state as a masculine institution. This is not necessarily to say that male administrators act masculine in a rational way as a conscious strategy or that the personalities of top male office-holders seep through and stain the institution; it is to point out that the overwhelming majority of top office-holders are men because there is a gendered configuring of recruitment and promotion, a gendered configuring of the internal division of labour and systems of control, and a gendered configuring of policy making, practical routines, and ways of mobilizing pleasure and content (p.73). Thus, I am not saying that men are collectively exploiting women as a purposeful strategy in the way patriarchy hypothesizes, but argue that performances of masculinity operate as nurtured strategies with the effect that unequal, hegemonic and masculine structures are preserved or restored.

There also is another reason to use hegemonic masculinity with care. Hegemonic masculinity in Nepal, unlike in the West, is not defined explicitly and exclusively in heteronormative terms. To be clear, a culture of compulsory heterosexuality is definitely hegemonic in Nepal and men in the COP of the National Elite certainly need to display competent heterosexual behaviour, as illustrated by (arranged) marriages and (family) expectations of a patrifocal kinship structure to raise children. Much like their counterparts in the West, it is necessary for men to be discrete about non-heterosexual desires and homosexual behaviour, but it is not always required to display an explicit erotic distaste towards other males, as is observed in the West. As in India, there is a culture of homosociability and homoaffectionalism, and homo-erotic relations are facilitated if not produced by dominant Nepalese patriarchy (Tamang, 2003). *Maasti*, playfully and sexually touching each other without openly acknowledging the fact is common in South Asia – often between men/boys sharing a bed in households that are accustomed to have separate sleeping rooms for male and female members of the family. In such circumstances, sleeping in the bed can easily lead to a wandering hand (Tamang, 2003). Categories of ‘heterosexual’ and ‘homosexual’ as commonly understood in the West are thus problematic for the Nepalese context. To illustrate, as opposed to Anglo/American concepts of masculinity, men in Nepal who only play the role of the ‘inserter’ in homosexual encounters are not conceptualized as homosexuals and neither is their masculinity (see Tamang, 2003 for background on this topic).

To make research on hegemonic masculinity concrete in this thesis, I introduce the concept of Elite Manhood to capture the norm in Nepal that implies the most honoured way of being a man in the COP of the National Elite. I write Elite Manhood with capital letters to denote a symbolic norm rather than any traditional practice, also to point out that members of the COP of the National Elite might only be liminally aware of this norm. I prefer Elite Manhood above the term Brahmanism (*bahunbad*), a conservative norm based on Brahman caste principles that Bahun and Chhetri men are said to pursue and is believed to stain the culture of government institutions (see Bista, 1990). Brahmanism isolates the question of masculinity to Nepal, failing to capture international and intercultural dimensions of hegemonic masculinity, and it often is used as a derogative term – not as an image for an honourable way of being a man. The term re-invigorates a stereotype of the Bahun as a cunning person, portraying ‘him’ as ‘a greedy priest, a crafty village moneylender, a stealer of other people’s land, who shuns rough and dirty work, carries with him an air of haughtiness, and is presumptuous and patronizing’ (Gellner *et al*., 2008 [1997]: 492). As I have argued, such an essentialist image is not helpful in an analysis on hegemonic masculinity because it sticks to all male Bahuns.

In using the term Elite Manhood, I also capture some of the international and intercultural dimensions of nationalism in Nepal that play a role in the (symbolic) imaginary of the COP of the National Elite, particularly for men. These dimensions are related to India and foreign aid. The relation between Nepal and India has developed since the 1950s in a way that the Nepalese male state elite 'shows' as emasculated in relation to the Indian male state elite.[5] The image of 'small Nepal' both at home and abroad is primarily shaped by its neighbours to the south and the north which are the most populous countries in the world (Panday, [1999] 2009: 295). The perception of size – being small, landlocked and marginalized – is a recurrent concern for members in the COP of the National Elite. This is illustrated by accusations of a leading Nepalese intellectual in the 1990s, Devendra Raj Panday, that the country's leadership needs to get rid of the 'defeatist complex' (in relation to India) and needs to 'think big' (2009 [1999]: 296). Paradoxically, 'thinking big' in Nepal is practically a synonym with 'thinking Indian'. 'Big brother' India is seen as an example of development – the countries share cultural affinity in many ways – but the word 'brotherly' smacks in Nepal of a view of a superior-subordinate relationship which India may exploit at all cost (Panday, 2009 [1999]: 311). For members in the COP of the National Elite, Indian leadership inherited the imperial mind-set of the British, a perception that has proven remarkably resilient in spite of the many personal and professional ties that exist between members of the elites of both countries.

In a similar fashion, particularly during the Panchayat era (1961-1990), there has always been a disjuncture between the rhetoric of nationalism and Nepal's international status as an aid recipient (Tamang, 2002). The massive 'intrusion' of foreign aid in Nepal poses a recurrent threat to the status (and masculinity) of the COP of the National Elite. In international relations, the aid recipient status of Nepal can be considered to exemplify 'femininity' (the Third World or the South) and the foreign assistance of donor countries can be considered to exemplify 'masculinity' (the West or the North). Historically, however, international development cooperation has also been recognized by the state elite as a way to restore masculinity vis-à-vis Indian leadership. Symbolizing Nepal's independence from India, members in the COP of the National Elite have been keen, from the 1940s onwards, to establish international diplomatic relations, secure aid and work with foreigners, particularly with those of the West. In these circumstances, performances of Elite Manhood, in relying on a culture of 'internationalism' (Panday, 2009 [1999]: 299), function as masculine 'gender projects' in Nepal to regain national pride and virility vis-à-vis the India elite.

Norms of Elite Manhood and practices of internationalism are of particular concern for irrigation engineers and water planners in the DOI. Water resources development is namely the area in which members in the COP of the National Elite are most likely to feel

[5] In Nepal, the Indian male state elite usually refers to the Indian leadership in Delhi or the Indian leadership in the state of Bihar and Uttar Pradesh.

emasculated in relation to their Indian counterparts. The lack of water resources development in Nepal has been identified as the main cause for the country's under-development. Nepalese and Indian engineers share professional aspirations, being often educated at the same engineering colleges in India, but Nepal's achievements in water infrastructure development are bleak compared with those in India – to date no large multi-purpose dams for hydropower and irrigation have been constructed in Nepal. In this context, the bilateral agreements on water sharing for the Kosi (1954) and Gandaki (1959) rivers function as sources of rivalry and are perceived as 'unfair' by the national elite of Nepal (Dhungel and Pun, 2009). Illustratively, Nepalese engineers have often felt aggravated during various official talks with India, because their Indian colleagues occasionally went to the point of humour just belittling the seriousness of the Nepalese concerns (see B.K. Pradhan, 2009, a former Director General of the DOI for his personal experiences). In short, performances of DOI irrigation engineers, in the practice of cooperation with India and other foreign partners, hold the promise to capitalize on the 'huge water development potential' of Nepal and regain pride and virility for the COP of the National Elite in the context of international development relations.

1.4.6 Irrigation governance, water professionalism and irrigation engineering

To approach masculinity in the professional irrigation world as an intercultural phenomenon and live up to my commitment, it is necessary to conceptualize the 'irrigation world' as an arena where various institutions and actors interact and integrate in terms of policy and decision making – as irrigation governance (Nuijten *et al*., 2004; Lund, 2006; Arts and Leroy, 2006; Arts *et al*., 2013). I take from 'governance' that the state is not the sole institution to initiate policy and projects, and that interventions in the field are the result of partnerships and negotiations between various national and foreign institutional actors (e.g. the state, farmer leaders, NGOs, lending agencies, private companies, research organisations). The knowledge practices of professionals of various institutions who engage in irrigation governance can be considered to fall under 'water professionalism'. I conceptualize water professionalism as an 'interpretative community' that functions as a relatively coherent group of people that share norms and values through social participation – as a COP. Mosse (2005) defines an interpretative community in development practice as a group of (professional) actors or policy elites that pursue a multiplicity of interests and which support the established order and presentation of knowledge. In this view, irrigation governance can be conceptualized as the product of negotiations *within* the COP of water professionalism or as the outcome of an interplay *between* professional sub-COPs in the overarching COP of water professionalism (see below for elaboration). This conceptualization avoids identifying irrigation departments, and the engineers who work there, as the usual suspect of male hegemony in irrigation.

As I have noted already, the water sector in Asia is an area of expertise that is historically managed as a field of irrigation engineering (Ongsakul *et al*., 2012). In contrast, the water sector in the Netherlands, for instance, is traditionally managed as a field of drainage and flood protection (Ham, 2003; 2007). On the South Asian continent, there is a strong British-Indian civil engineering (and bureaucratic) tradition in irrigation (Zwarteveen, 2011), and the interpretative community of irrigation engineering constitutes the most powerful and coherent professional sub-COP within the overarching COP of water professionalism, both in India and in Nepal. Illustratively, in an exploratory study of 1982 on 'participatory irrigation management', an officer of the NPC in Nepal observantly noted the existence of an 'irrigation organisation' and 'agricultural organisation' in the irrigation development sector. He noted: 'The irrigation organisation is an old establishment whereas the agricultural organisation is a recent one in many countries' (B.B. Pradhan, 1982: 4). As the quote makes clear, he talked about an international tradition in irrigation – not specifically about Nepal or the DOI and the Department of Agriculture (DA) in Nepal. In the 'irrigation organisation', national irrigation departments had an important position, as well as the highly-centralized, formal bureaucracies of donor groups which assigned a major role in irrigation development to the technical agencies of the state (Coward *et al*., 1982). Their working relation was characterized by the routine use of standard designs and rapid loan disbursement whereby the latter was seen as a measure of project performance. In short, the 'irrigation organisation' represented the alignment of an international and national policy elite around a modernisation project and institutional reproduction interests – an alliance and interpretative community that is still strong in irrigation governance (see Singh *et al*., 2014 for Nepal and Suhardiman and Mollinga, 2012 for Indonesia).

In this thesis, I conceptualize the 'irrigation organisation' as a sub-COP in the overarching COP of water professionalism – as the COP of the Irrigation Organization. In short, this COP contains the DOI as key actor in Nepal, but it also includes members of engineering colleges, professional engineering associations, engineering consultants, contractors, and international lending agencies (WB, ADB) as financers of the COP. I define the COP of the Irrigation Organisation as a coherent learning environment in irrigation for professional performance, functioning as a robust interpretative community of national and foreign professionals in irrigation which has vested interests in the practice (and presentation) of knowledge and policy. The practice in the COP of the Irrigation Organisation can be considered to constitute 'normal professionalism' in irrigation, a term coined by Chambers (1988) to describe the dominance of (civil) engineering in India in relation to canal irrigation system management, and then elaborated by Zwarteveen (2006) to capture associations between professional normalcy and normative masculinity in irrigation engineering (see p.19, footnote 1). I prefer the use of the COP of the Irrigation Organisation above the term 'hydrocracy' (Wester, 2008; Molle *et al*., 2009) and 'water establishment' (Gyawali, 2013). The term hydrocracy hints at the vested interests of certain actors in irrigation infrastructure development, but it is mainly used as a synonym for 'national hydraulic bureaucracies' – not for other national and international players behind these interests. The term water establishment acknowledges the existence of a coherent professional community in water and also hints at vested interests, but it is not very precise and too broad for analysis. Within the COP of the Irrigation Organisation, as mentioned already, I focus the analysis on the professional performance of one (key) actor – the irrigation engineer in the DOI. To avoid confusion with other irrigation engineers in the COP of the Irrigation Organization (consultants, contractors, university teachers), I refer to the Irrigation Engineer in this thesis, written with capital letters, also to denote that I am not referring to any existing person or respondent in the DOI.

To clarify, talking about the 'Irrigation Engineer' should be done with caution. It easily can enact a view of a static technocrat, an image of a symbolic ghost in the profession, and such a straw man is not useful for analysis (see Wilson, 2006 for critique on the use of the term 'technocrat'). My intention in using the term is to capture a changing and self-referential (and thus reflexive) professional performance in the DOI that is associated with an image of the Irrigation Engineer at the group level – not necessarily at the individual level. Broadly, the image of the Irrigation Engineer can be considered to relate to a self-referential experience of being seen as a provider of solutions to the technological needs of a society.

In this book, I also talk occasionally about other professional (sub) COPs in irrigation. One is an interdisciplinary group of engineers, agricultural specialists, economists and sociologists, who engaged in research in the late 1980s and 90s in Nepal on technology and new irrigation system management options. This group of professionals developed into a relatively robust and influential COP of scholars and researchers who interacted with the Irrigation Engineer and other members in the COP of the Irrigation Organisation in redefining irrigation interventions programmes and in developing policies for 'participatory irrigation management' (PIM) (IIMI/WECS, 1987; Levine, 2013). As I have noted, my professional orientation lies with this school of thought and I consider myself a member in this COP.

In consistently using the term 'COP' for the Irrigation Organisation, it is apparent for analytical purposes that the Irrigation Organisation is simultaneously a COP of masculinities and femininities and also, that the Irrigation Engineer and 'his' professional performance is the product of 'his' capacity to perform in the COP of the National Elite and vice versa. Engineers are also sons, husbands and fathers, performing gender and having a class and caste identity – a reality that the concept of COP aptly captures in the use of the same term for various peer groups and social learning environments.

1.5 Research methodology

My PhD research project has been conducted between 2008 and 2014, covering a period of approximately 6,5 years of data collection, analysis and writing. The first year I spent at Wageningen University, developing a research proposal and getting acquainted with feminist theory and research methods. The latter was critical for this project because I was originally trained as an (interdisciplinary) water professional at the IWE group and my understanding of gender debates in development was limited. For my training, I went to Utrecht University and I followed an intensive summer school on feminist theory. The courses were a big eye-opener for me and I guess for any water professional. At Wageningen University, there are some researchers working on gender and there are some courses offered on it, but overall, the topic is nearly invisible. In Utrecht, I learned that feminist scholarship is a broad and established field of study, offering a wide range of analytical perspectives to understand historical and contemporary developments in our world – also for developments in the world of irrigation. The lessons from Utrecht on subjectivity, agency, intersectionality and masculinity form the basis for the theoretical framework of this thesis.

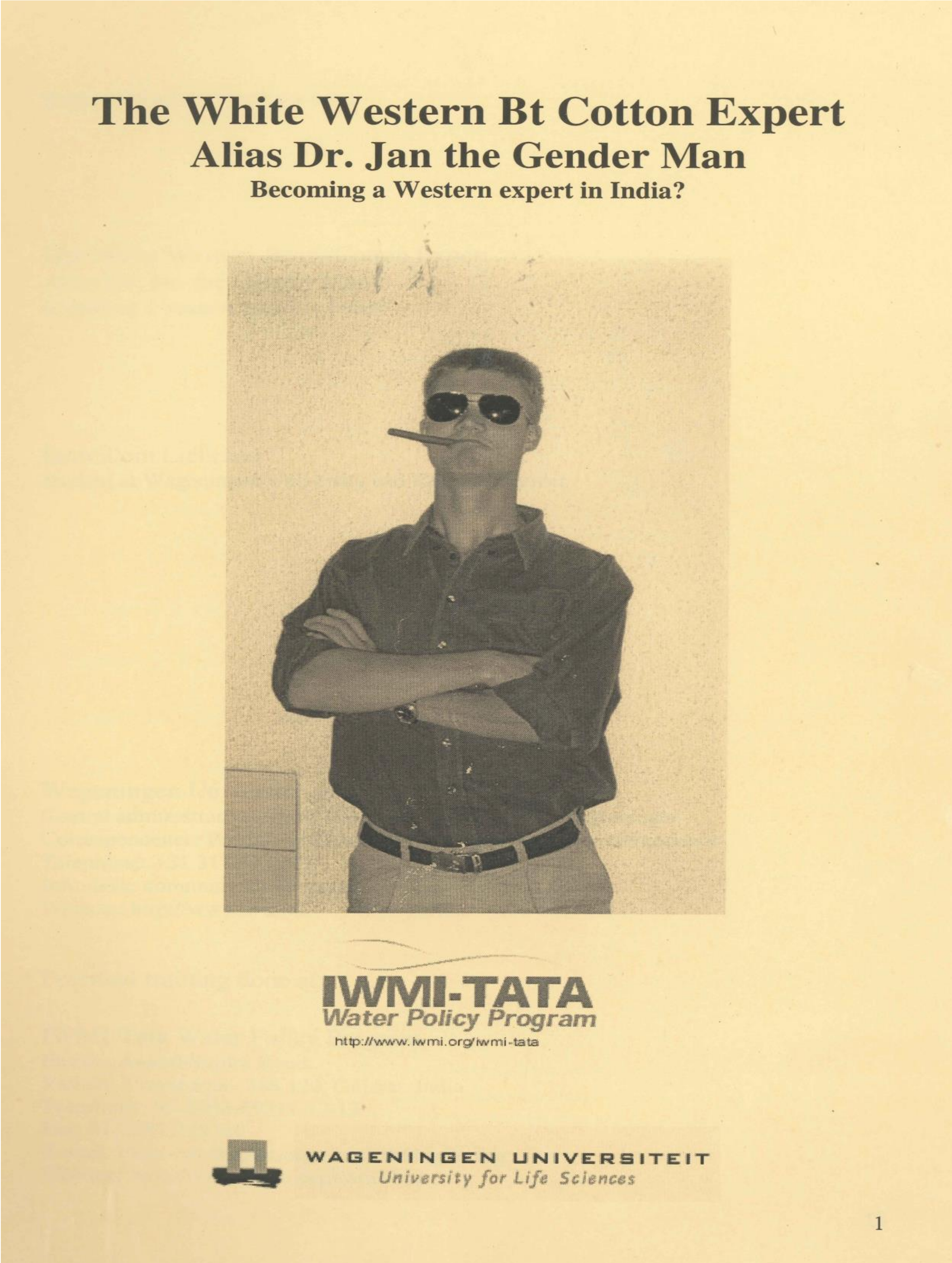
The period between April 2009 and September 2011 (about 2,5 years), I lived in Nepal, Kathmandu together with my wife, Riti Hermán Mostert. I am mentioning her – and her status as ‘my wife’ in relation to my status as a ‘husband’ – because she has played a role in this research (see below). To write about a contentious and culturally situated topic like masculinities, we went to Nepal for an extended period of time. I was keen to experience ‘Nepal’ and the expat community in Kathmandu as much as possible. In Nepal, I developed an approach of relying on multiple research methods – ethnographic observations, self-reflections, interviews, questionnaires, documentation research, and case studies on irrigation projects. These methods are briefly explained below. The remaining years (about 2,5 years), I spent in the Netherlands at Wageningen University on writing the thesis.

1.5.1 An anthropology through experience, performance and self-reflection

Reflections on ethnographic observations in interactions with irrigation engineers and fellow professionals, both from India and Nepal and from the West, have critically informed this thesis. Life is full of gender and we may base a great deal of talk and action on the concepts of ‘masculinity’ and ‘femininity’ but they prove remarkably elusive and difficult to define (Connell, 2005 [1995]: 3). In order to get grip on the all-encompassing idea of masculinity, I have approached my research – in the words of Victor Turner – as an anthropology *through* experience and performance (cf. John, 2008). When considering professional performance as cultural performance, it follows that my own (academic) professional performance is (also) a cultural performance and this thesis an expression of experience. Writing down detailed ethnographic reports of my experiences and observations proved cumbersome. I had never been trained for this, I did not know what to write down (and what not) and I got lost in self-reflections. I got better at it but I (also) decided to make photos of occasions that I considered ‘masculine’ or typical for Nepal or for the irrigation profession, sometimes staging or asking persons to pose in a particular way (e.g. stand in front of a structure during a field visit, holding a technical map for the camera during a discussion). Later, I could reflect on these pictures with other persons, often with Riti. This method enabled me to ‘document’ performances of masculinity – in relation to professional performances of irrigation engineers, in relation to interactions between irrigation engineers and myself, and in relation to myself as a Western, male water professional in Nepal. Three examples are worth highlighting.

The first example is from my internship in India in 2002-2003. The picture in Figure 1.3 shows the front page of my internship report: I am posing as a ‘Western expert in India’. The photo was meant as a joke, but not as one without a serious meaning. At the IWMI-Tata office in India, Gujarat, I shared my time with a bunch of Indian, junior male staff who were graduates of the Institute of Rural Management and Agriculture (IRMA). With hindsight, the interaction in the office with my Indian friends provided for a safe environment to ‘explore’ professional performances and associated identities of masculinity – terms that were not part of my vocabulary then. At one day, one of my Indian male friends invited me to join a seminar on Bt Cotton (a high-yielding cotton variety) at the nearby IRMA institute. I hesitated because I knew nothing about it and I explained that to him. He laughed in response, knowing about my self-questioning to come to terms with an assumed Western superiority in development which I perceived to carry the imprint of colonial times. He suggested that I could always present myself as a Western expert and so we went. As I understood the ‘joke’, he suggested that my Caucasian appearance – my ‘whiteness’ and my ‘tallness’ – would give me sufficient cultural credit in the meeting as a participating professional. Since then, my nickname at the office was the ‘White Western Bt Cotton Expert’ and also, ‘Dr. Jan the Gender Man’ because I had picked up an interest for (grassroots) gender issues in one of the projects of the office. The joke of these names was that a highly-paid Western expert supposedly knows it all, from Bt Cotton to gender, ‘telling’ Indians what to do. In the small talk that followed, we occasionally shared laughter about how such a Western expert would act and behave. At the end of my time in India, I decided to stage the performance of a highly-paid, Western expert and produce a photograph that I could use for my internship report.

Figure 1.3: Performing masculinity in India



Mid 2003: The front page of my internship report presenting the staged picture: 'The White Western Bt Cotton Expert Alias Dr. Jan the Gender Man', as start for self-reflection of 'becoming a Western expert in India'.

Figure 1.4: Performances of masculinity in Nepal

May 2010: Joining an engineer into the field, Patihani Village Development Committee (VDC), Chitwan District. We are posing in front of the construction works. A member of the Water User Association (WUA), holding a big umbrella, and a child is also visible in the picture.

October 2010: Receiving tikkas during Dashain celebrations. Riti and I, both sitting on the right in the picture, pay a visit of honour to a senior DOI engineer and 'his wife', receiving tikkas in return.

The photo is basically a dramatized cultural performance of a 'western expert', according to an interpretation of talk with my Indian friends. All the details in the photo were carefully planned: the sunglasses, the cigar, the belt, a neat shirt and trousers, and of course the posture. The most striking feature of the photo is the 'masculinity' of the expert, playfully and intuitively created in interaction with my Indian colleagues – an observation that I only came to see later. Interestingly, I later learned from Margreet Zwarteveen (then my internship supervisor), how some staff members at the IWE group had (mis)interpreted the picture. They did not see the joke and considered the photo over-the-top, seeing a student who considers himself very important, bragging and acting arrogant. I take from this that my dramatized performance of the expert was a more than a faithful translation of perceptions of how I was seen as a person at the group (apparently as a masculine personality), or that it closely mirrored how staff at the group saw Western experts themselves (apparently also as very masculine), raising feelings of discomfort which fed into a different reading of the picture.

The second and third examples are from Nepal. The first picture in Figure 1.4 shows an irrigation engineer of the DOI and I posing in front of construction works in Chitwan District. He proposed to take the photo and suggested to stand in front of the newly constructed canal. I consider the picture typical because engineers like to be seen (and identified) with 'their' structures. The picture also shows that I am tall and young compared to 'my' Nepalese counterpart. Being (physically) tall matters in Nepal (as it does in the West) and I learned that it carries strong masculine connotations for young men. In the first hours that I had entered the district's irrigation office in Chitwan for the first time, to stay there for a few days, I was given the nickname 'thagu'. Upon inquiries and reflections with engineers in the office, I was explained that thagu is a Gurung word (one of the indigenous languages in Nepal) for 'big son' or 'first son'. He is expected to be the head of the household and has most opportunities to marry a second (and younger) girl of his liking after a first (arranged) marriage. In short, thagu – young, physically strong men – have bright (heterosexual) prospects.

The second picture in Figure 1.4 shows Riti and I receiving *tikkas* from a senior DOI engineer and his wife during Dashain celebrations (an important Hindu festival). I requested to make a picture of this happy occasion and a member of the household helped out. In Nepal, young family members are expected to pay tribute to senior family members during Dashain, and senior family members are expected to acknowledge the act and give their blessings. In our case, being unaware of these traditions, we were invited for a visit and participated in the ritual. The proper performance of the ritual is to undergo this as 'husband' and 'wife', at least for couples who are married. The picture reveals how the masculinity of the DOI engineer and myself as 'husbands' is constructed in relation to the femininity of 'our wives'. It also reveals how performances of masculinity and femininity in Nepal intersect with age.

In various ways, these photographed performances – and essentially they are all staged – tell something about masculinity, in India and in Nepal, in the Netherlands and at the IWE group, in irrigation professionalism and in an intercultural context. In obtaining an anthropology through experience in Nepal, it helped that Riti and I build up a 'normal life' as expats in Kathmandu. I did my job as a PhD researcher of Wageningen University, being hosted in Nepal by the Nepal Engineering College (*NEC*) and attending conferences on irrigation. Riti pursued her profession as a consultant for the Organisation Development Centre in Nepal (ODC, Pulchowk). Besides our jobs, we occasionally visited an expat church community, we did social work for the Dutch consulate in a Kathmandu prison, we learned about the Nepalese education system through the sponsorship of a girl, we were members of cycle and football clubs, we travelled through Nepal for trekking and we attended social occasions like Nepalese weddings, festival celebrations and rice-feeding ceremonies. These activities gave us a fair amount of exposure to 'Nepal', in particular to the government and professional elites in Kathmandu and its relations with the expat community.

1.5.2 Interviews with the Irrigation Engineer

To understand how irrigation engineers talk about and experience their professional life, I conducted 9 life history interviews with relatively senior engineers (see Annex 1 for details of respondents). Among the respondents were 8 Nepalese engineers, among them one female engineer, and one Dutch engineer. I approached retired engineers as well as engineers who were still in DOI service. Among the respondents was one overseer and I also tried to take into account a representation of caste background (B/C, Newar, Madhesi). The female engineer is one of the few female, Roorkee College (now, the Indian Institute of Technology, Roorkee) graduates in Nepal who has pursued a career in the water sector. She did not engage in government service. All Nepalese engineers are civil engineers, except for Mr. Huta Ram Baidya, who was known as the first agricultural engineer of Nepal (he has now passed away). He never worked for the DOI, there was no department for irrigation in the 1940s and early 50s, but he did work on irrigation (Baidya, 1968). I also interviewed one Dutch irrigation engineer and former SNV staff member, Mr. Arend van Riessen, who is still residing in Nepal. He has studied at Wageningen University and his life history has functioned as an important source of self-reflection for me, being a Wageningen graduate myself, and for comparison with the life histories of Nepalese engineers. The availability (or selection) of engineers depended largely on their willingness to conduct long interviews. Interviews were conducted at homes, at offices and sometimes, during field visits, when walking along the canal banks of a project. This was a new research method for me. With the first respondent, I recorded (mp3-files) more than 15 hours of interview, spread over 8 meetings. Later, I conducted interviews in about 3 hours, spread over 2 or 3 meetings. Apart from interviews and using their curriculum vitae as a source of information, I also asked respondents to present a photo of themselves or pictures of 'their' irrigation projects if available. Except for the engineers mentioned above, I have used fictitious names for respondents in this book. An exception is Chapter 7, in which I give real names of engineers. These persons have not acted as respondent for this research, nor are they discussed 'as individuals' in this thesis.

I have analysed the interviews as cultural performances. This means that the interview counts for what was said and how it is said and to whom (Agrosino, 2002; Ritchie, 2003). By telling how it was, the interviews were not necessarily about producing accurate historical information, but more about using dramatic techniques to create and enact a credible professional performance. Here, I understand cultural performance, per definition, as a product of interaction between two people. This means that respondents told things and acted in ways, at least partially, *because of me*. This goes further than questions that I asked. My identity as an irrigation professional, male gender, and (bodily) appearance, knowingly or unwittingly, informed ways of acting and answers of engineers (and vice versa). Illustratively, most engineers were willing to participate in interviews after sharing my enthusiasm for the field of irrigation – as a man to another man – and telling them that I am also educated as an interdisciplinary irrigation engineer and water management professional.

Apart from life history interviews and casual talk with engineers, I organised a meeting with all female engineers in the DOI. The details of this meeting are presented in Chapter 5. Here, it suffices to say that there were 15 participants and that they liked the invitation for the meeting, because it had addressed them as 'engineers' – not as 'lady engineers'.

1.5.3 Questionnaire for the Irrigation Engineer

To document attitudes and views of DOI engineers on social norms and gender stereotypes and to understand their perceptions on professional practice and engineering, I designed a questionnaire. I divided it in 4 sections: (a) background information of the respondents; (b) questions about attitudes, opinions and gender stereotypes in relation to social norms; (c) a section on professional practice and perceptions on engineering; and (d) questions about user participation and gender policies in irrigation. A first round of questionnaires resulted in 11 respondents. Then, I adjusted the questionnaire and had it translated in Nepalese. The design (and adjustment) of the questions is explained in detail in Chapter 4.

I aimed for a sample size of approximately 5% of the core staff of the DOI. The core staff was defined as officers in the gazetted class categories (engineers) and the non-gazetted first-class category (overseers or sub-engineers). The terms 'gazetted' and 'non-gazetted' categories refer to a class structure in the civil service of Nepal. The terms can be understood as 'high' and 'low' level positions in the DOI. In 2008, the total number of core staff was 842 officers (DOI, 2008). This number also included general administrators, economists and sociologists. In total, I collected 39 questionnaires (see Annex 2). To maintain coherence among the respondents and keep the focus on engineers, I omitted 3 questionnaires for the main analysis and kept them aside as reference material (a sociologist and agricultural economist of the DOI, and an agriculturalist of the DA). The remaining 36 questionnaires accounted for more than 4% of the core staff of the DOI, and for close to 5% of all engineers among the core staff. This number included two engineers that had left DOI service some time ago and one recently retired DOI engineer.

The questionnaires were collected at the head office of the DOI (Kathmandu, Jawalakhel), the office of the Central Development Region (also in Kathmandu, between Bhani Mandal and Makhu Chowk), and three divisional offices at district level (Chitwan, Jhapa and Panchtar). Gazetted officers are overrepresented in the sample, because most questionnaires have been collected at the central offices in Kathmandu. This was my intention, at least partially, because I was keen to have the figureheads and role models of the DOI respond to the questionnaire. I was also keen to have as many women engineers responding to the questionnaire, given the subject of my thesis. This was not difficult, because they work mostly in the central offices of the DOI. In total, 10 women officers acted as respondents. Not all questionnaires were filled in completely. Some of the questions were difficult to grasp and some respondents reported that they got bored or that the questionnaire took too much of their time. The empty boxes in the questionnaire have been taken into account by reporting in the text the total number of respondents for a particular question (e.g. n = 36, n = 30, n = 28).

The respondents are coded to treat their answers anonymously. For instance, Q12MGIII is a code for a respondent: ‘Q12’ stands for questionnaire number, Q1, Q2, Q3 etc.; ‘M’ stands for the gender of the respondent, M for male and F for female; and ‘GIII’ stands for gazetted third class, NGI is non-gazetted first class, and GI, GII and GIII stand respectively for gazetted first, second and third class. These codes are used in the main text.

1.5.4 Documentation research

This thesis relies extensively on documentation research in Nepal. In total, I have collected more than 450 documents, from various libraries, documentation centres and private collections (see Annex 3). The collection covers the period 1950 to 2010, the era of modern development (bikas) in Nepal and focusses broadly on the topics of (state) irrigation, agricultural development and (women) professionals in development. It contains original policy documents, project reports and conference proceedings. Many of these documents were difficult to locate. An example is the first ‘Report to the government of Nepal on irrigation’, from 1953, written by Mr. S. Theuvenet, an irrigation expert of the Food and Agricultural Organisation (FAO) of the United Nations (UN) and presumably a Dutch engineer (see Chapter 7 for further discussion). This research served three purposes: (1) documentation research to contextualize (state) irrigation development in Nepal (‘what happened'); (2) critical reading of original documents to re-interpret the mainstream irrigation development narrative in Nepal from a (feminist) perspective ('how and what information is presented as history'; 'what are silences in irrigation history'); and (3) an analysis of pictorial documents (photos) and technical representations in knowledge to scrutinize, from a historical view, the gender of the irrigation profession and to understand, from a cultural performance view, how experts, planners and engineers give expression to their experience and create credible voices for themselves ('what is the performativity of irrigation knowledge').

Documentation research in Nepal is a challenge. There are some libraries in Nepal with a decent system for record searching, but documentation centres in government offices are generally in poor condition. There is often no organized monitoring of records, documents are lost and sometimes, officers are unaware of the existence of a library. This is also true for two collections that were found most valuable for this research. The 'old' APROSC library (Agricultural Projects Services Centre, a public research organisation that no longer exists) was largely left unattended in a building of the National Agriculture Research Council (NARC). In this library, I found many original documents on development projects from the 1950s and 60s. The other one is the 'old' library of IMSSG (Irrigation Management Systems Study Group, a group of researchers interested in irrigation, based on the campus of the Institute of Agriculture and Animal Science, IAAS, Rampur, Chitwan between 1985-2002). This collection was found in complete disorder, locked away in a room and largely forgotten. In contrast, the documentation centre of the Water and Energy Commission Secretariat (WECS), located in Singha Durbar, was found in a well-kept condition, having many original policy documents on irrigation, particularly from the 1970s, 80s and 90s.

Libraries of NGOs and INGOs, documentation centres of engineering consultancy firms and personal collections of engineers, were found in a much better condition and proved to be a valuable source of information. Particularly worth mentioning is the Madan library, an institution affiliated with Social Science Baha, a forum for research and critical debate in Nepal. This library is building up its collection and has many old documents, dating back to the Rana period (1846-1951) and the first decades of modern development. Also worth naming is the private collection of Dr. Prachanda Pradhan, an irrigation expert in Nepal with over 40 years of experience. He donated his 'irrigation bibliography' of more than 2.000 records (from the 1970s onwards) to the library of Nepal Engineering College (*NEC*).

1.5.5 Case studies on Chitwan District and the Mechi project

To contextualize my investigations on 'masculinities in irrigation' and keep my feet on the ground in research on what can be an abstract and fluid topic, I selected two case studies: (1) irrigation development in Chitwan District (central Nepal) between 1950 and 2010, and (2) the Mechi Hill Irrigation and Related Development Project (MHIRDP) (east Nepal), implemented between 1987 and 1992, hereafter called 'the Mechi project'. Chitwan and the Mechi project are not presented in this book as 'case studies' but information from these (field) studies is integrated in the text and used to illustrate concrete examples (see Textbox 1.1 for a background of the Mechi project). In Nepal, the selection of case studies allowed me to get access to engineers for interviews and it helped me to make discussion and interaction with engineers concrete. For instance, I went to the district irrigation office of Chitwan, joined DOI engineers in the field and during inspections of construction works, we talked about professional experiences and aspirations. Likewise, the selection of the Mechi project gave me plenty of opportunity to interact with engineers who had been involved in the project and also, to see how their careers had developed. It allowed me to plan field trips with Arend van Riessen, then the SNV project-engineer, to 'revisit' the project and interact with engineers, farmers and district administrators along the way. It also gave me a reason to interview Dutch, ex-SNV engineers in the Netherlands and learn about their experiences.

Textbox 1.1: Background on the Mechi project, phase I (1987-1992)

The Mechi project was the flagship programme of SNV-Nepal. The Dutch government and SNV believed that by executing and managing its own programme, it could avoid negative experiences such as a lack of community and women's participation and also, that it could reduce operational costs. The Mechi project concentrated on three hill districts in East Nepal, focussing on the rehabilitation and construction of about 60 hill irrigation systems (total about 1200 ha) and the implementation of community water supply systems. The formation and training of users' committees for self-reliance was an integral part of the programme. During the initial years, SNV was accountable for its activities to the Ministry of Panchayat and Local Development (MPLD) and the Ministry of Agriculture. The Mechi project was set up as a self-managed rural development programme and the MPLD only monitored the programme from a distance. From 1989 onward, as a result of administrative reforms, SNV engineers started to work with DOI engineers as their counterpart when it concerned irrigation projects. The Netherlands contributed 85% of the project cost (5.2 million Dutch guilders; approximately 1.5 million USD) and the Nepalese government 15% (8.4 million Nepalese rupees; approximately 0.25 million USD). In total, the programme employed about 6 to 8 Dutch engineers and 1 Dutch socio-economists, and about 60 Nepalese professionals.

Source: HMG-N/SNV, 1987; MOFA, 1998

My reasons to select Chitwan and the Mechi project as case studies are fairly straightforward. It can be said that modern development in Nepal started in Chitwan District in 1952, with the start of the 'Rapti Valley Development Project' (RVDP). Since then, development in the district has been perceived as a model for places elsewhere in Nepal, and the district has been at the forefront of new policy initiatives – also in relation to irrigation development. Chitwan is one of the most 'researched' districts in Nepal, providing for sufficient documentation for a critical reading of its (irrigation) history. Furthermore, one of my hosts at *NEC*, Mr. Ashutosh Shukla, had worked for a long time in the district, at IAAS, and he brought me in contact with farmer leaders in the district. The Mechi project was brought to my attention during a paper presentation that I gave at the Fifth International Seminar of the Farmer Managed Irrigation Systems Promotion Trust, held on 25-26 March in 2010, Kathmandu (Liebrand, 2010). The paper was about gender issues in irrigation and a member of the audience suggested to look into the Mechi project, because this was one of the first irrigation projects in Nepal that had sought to include women in project development. It so happened that Arend van Riessen was also in the audience and contact was established. He was keen to re-visit 'his' project, had extensive project documentation available and the Dutch connections in the project allowed me to visit Dutch ex-SNV engineers in the Netherlands. Furthermore, as I have mentioned, the trustful interaction with him enabled me to engage in (self) reflections, both being educated in Wageningen and being from the same country.

1.6 Limitations of this study and a word for (male) irrigation engineers

This thesis has two major shortcomings. One has already been mentioned. The thesis focusses almost exclusively on the performance of the Irrigation Engineer and the DOI in Nepal, based on the received wisdom and claim that the bureaucratic tradition in irrigation represents the most dominant form of male hegemony in the water sector. This is not necessarily true and this view hampers our understanding how male hegemony is sustained across organisational and cultural borders – as a phenomenon that broadly exists in institutions in the COP of the Irrigation Organisation and the overarching COP of water professionalism. Furthermore, the thesis focusses almost exclusively on performances of masculinity in the professional domain of irrigation, based on the assumption that it is possible to identify masculinities within the boundaries of professionalism. This is actually very difficult. As I have noted, engineers are also members in the COP of the National Elite, performing as sons or daughters, husbands or wives, fathers or mothers (see the discussion on gender and intersectionality). It is the gender structure and performances of masculinity and femininity *itself* that construct boundaries between the family sphere and the professional sphere, and masculinities of irrigation professionals are thus also the masculinities of the families of irrigation professionals.

This research was originally conducted with two audiences in mind, as I have mentioned. For the reflexive engineer and development practitioner, however, this thesis may present a disheartening read, studying 'their' professional performance and questioning technical conventions and practices of scientific knowledge. For these readers, it helps to keep in mind that feminist theory comes with particular terminology and research methods. To illustrate: feminist scholars talk about the 'subordination' and 'invisibility' of women professionals in engineering organisations, while reflexive engineers may talk about the 'absence' and 'shortage' of women professionals; and feminists posit that self-reflections on 'subjectivity' and writing in the 'I' form is critical for academic inquiry, while engineers and development practitioners seek to avoid 'subjectivity' at all cost and rather talk about 'positionality' or 'participatory observation' (Herr and Anderson, 2005). I can only iterate here that this thesis is *not* meant to suggest that (male) irrigation engineers are oppressors or to show that their knowledge is wrong. The thesis is meant to be an example and source of inspiration for (male) water professionals who are interested to reflect in the profession on masculinities, by taking their own experiences of masculinity as a starting point. Further research is necessary, what such reflections (could) possibly imply for the position of the reflexive engineer.

1.7 The structure of the book

This thesis consists of 8 chapters, including Chapter 1. In **Chapter 2**, I present historical contexts of irrigation development in Nepal. In a birds-eye overview, it presents the mainstream irrigation history of Nepal; it analyses the education system and the civil service in Nepal of which engineering colleges and the DOI are part, and it presents an historical (feminist) analysis on the status of women professionals in development in Nepal. The following three chapters, Chapters 3, 4 and 5 focus on the first research question of this thesis: how boys and girls become an Irrigation Engineer in Nepal and the masculinities that are involved in the process. **Chapter 3** conceptualizes roadways for becoming an Irrigation Engineer and presents a historical analysis of the formal institutions that constitute this roadway. These institutions are: (1) engineering education; (2) professional regulation and engineering associations; and (3) the DOI. **Chapter 4** investigates the stereotypes and social norms that govern the informal milieu of these institutions and analyses how young engineers develop agency and desire in the DOI for professional performance through self-normalization and transitional performance. **Chapter 5** focusses on the position of female engineers (and 'other men') in the DOI. It analyses the opportunities for women engineers to engage in self-normalization and transitional performance; it investigates the cultural taboo of going to the field for women professionals, and it documents the (additional) disadvantages that women face in the pursuit of a career in the professional sphere of the DOI.

Chapter 6 and 7 focus on the second research question of this thesis; the perfomativity of irrigation knowledge; the role of technical representations in the enactment of professional credibility and the masculinities that might be implicated in it. **Chapter 6** analyses the performativity of irrigation data. It analyses the construction of numbers on irrigation in Nepal and it investigates the (gender) composition of foreign and national policy elites behind these numbers. **Chapter 7** presents a critical (feminist) analysis of irrigation development in Nepal and the role of engineers and planners in it, focussing on Chitwan District. The goal is to study how 'our knowledges' in irrigation and development are related to 'ourselves' – as engineers, professionals and researchers. In this chapter, I make use of photos of irrigation projects and engineers to decipher the changing associations between professional performance and masculinities in irrigation. **Chapter 8** presents the main findings of the thesis. It also presents reflections on the research methodology and it identifies ways ahead for research on masculinities among irrigation engineers and water professionals.

Chapter 2:

Historical contexts of irrigation development in Nepal

2.1 Introduction

This chapter presents background research for the chapters to come (Chapter 3 to 7). The chapter is divided in three parts. The first part presents a history of irrigation development in Nepal. This history can be considered the mainstream ‘performance’ of academic literature and irrigation policy documents on Nepal, although it remains my interpretation. The goal is to describe the ‘experience’ of bikas in irrigation development in Nepal and identify some of the events, concepts, terminologies and projects that have come to constitute the world of the Irrigation Engineer and that of other policy actors in irrigation governance. For clarification, the goal is to acknowledge the larger trends in irrigation governance in relation to the changing position of the Irrigation Engineer – not to discuss specific projects, policies or organisations. There is in-depth literature for this (Shukla and Sharma, 1997; Shivakoti and Ostrom, 2002; Khanal, 2003; Gautam, 2006; Dhungel and Pun, 2009) and a history of the DOI comes in Chapter 3. The second part of this chapter presents a background analysis on the education system and the civil service in Nepal. Engineering colleges and the DOI are part of these institutions. An analysis of the bureaucratic tradition in Nepal is important, because it (also) is associated with male hegemony in irrigation (Lynch, 1993). The focus is on identifying people’s access to these institutions and on analysing the ‘roadways’ in these institutions to make a professional career. Generally, there is much literature on the civil service in Nepal (P. Pradhan, 1971; Caplan, 1975; Shrestha, 2001; Dangal, 2005; Poudyal, 2009), but questions of gender, class, caste and ethnicity are not explicitly addressed in this writing. The third part of this chapter presents a historical (feminist) analysis of the position of women professionals in development in Nepal. This history can be considered an ‘alternative’ performance of academic literature and development policy documents on Nepal: it presents a history of women professionals in Nepal as it is not well known, with an occasional reference to irrigation. The goal is to verify the received wisdom that the ‘entry’ of women professionals in irrigation engineering and in water professionalism in South Asia, is something ‘new’ (SaciWaters, 2011), and to search for explanations why women engineers in Nepal to date have largely remained ‘absent’ as officers in the DOI.

2.2 Irrigation development in Nepal

Two figures in this part require some explanation (Figure 2.1 and 2.2). These figures add a visually performative element to the irrigation history of Nepal, but they are not derived from any existing literature. I compiled them myself by using scales and terms commonly used in irrigation literature, aiming to bring into existence an experience of bikas in irrigation more clearly. A time line of some important events is presented in Figure 2.4 as a reference.

2.2.1 Self-governance sanctioned and taxed by Hindu courts (before 1950s)

Irrigation in Nepal is an old practice. In the Terai, it was practised as early as 400 BC and in the Kathmandu Valley, irrigation systems were developed as early as the sixth century AD. Elsewhere in Nepal, in the much less fertile valleys of the Hills, rice terraces were built by cultivators as early as the twelfth century AD (Shukla and Sharma, 1997; Sharma, 2004; Whelpton, 2005). Irrigation technology in Nepal – the practice of building terraces and the construction of canals – was developed alongside the expansion of wet-rice cultivation. Irrigated paddy fields in the Hills are called *khet*, a word that integrates the practice of irrigation (gravity irrigation, flooding the land), a type of field (levelled plots with bunds), and the type of crop cultivated (rice) (Aubriot, 2004). It is generally assumed that Indo-Aryan Parbatiya people introduced irrigation practices in Nepal through migration roughly from West to East. This assumption holds that wet-rice cultivation was introduced as part of Hindu culture and Indian agricultural practices. In Hindu culture, rice is considered a noble product, the favourite food of both deities and humans; rice is an element of social hierarchies since one cannot accept boiled rice prepared by a member of a lower caste, and rice was a way of classifying the environment (see *khet* as an example above) (Aubriot, 2004; Bennett, 2005 [1983]). Given the significance of rice for Hindu culture, it is assumed that rice cultivation and agricultural intensification became established practices as part of processes of Hinduisation.

The spread of Hinduism and the introduction of irrigated rice cultivation in Nepal co-evolved with new modes of state governance. Hinduism was established in the Kathmandu Valley as early as the fifth century AD. Outside the Kathmandu Valley, around 1500 AD, Hinduism became more widespread with the growth of Hindu kingdoms in the Hills (Regmi, 1999 [1972]). Many of these Hindu kingdoms imposed legal codes to regulate economic and social relations among subjects, most of whom belonged to non-Hindu tribal or ethnic communities. These legal codes often included rules for taxation of agricultural and irrigated lands, and sometimes also provisions for the development and maintenance of irrigation canals. Irrigation was a concern for these states, because the agricultural produce was an important source of revenue for the courts (Benjamin *et al*., 1994; Liebrand, 2010).

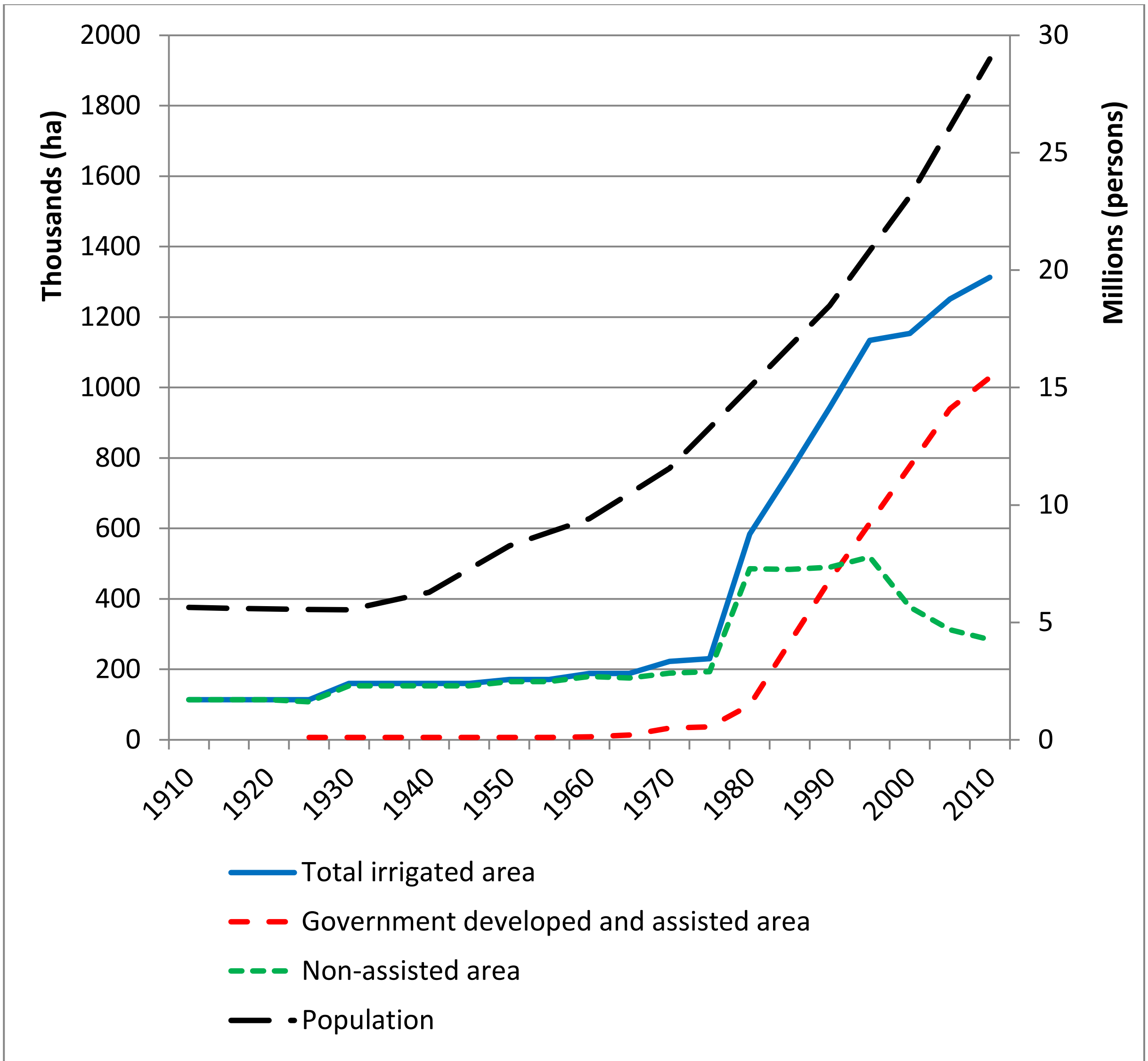
Over time, particularly after 1776 when the Kathmandu Valley was brought under the central administration of King Prithvi Narayan Shah, rules and regulations for agricultural taxation and irrigation grew in complexity. In the Kathmandu Valley, there existed the highest degree of state involvement in irrigation but also elsewhere in the eighteenth and nineteenth century, the kingdom provided material and financial support for the construction of canals (known as *raj kulo* or royal canals) (Regmi, 1999 [1972]; 1999 [1977]). Systems were also developed on land that was under the authority of a *guthi* (religious trust) (P. Pradhan, 1989). The construction of irrigation systems was sanctioned by the state or landlords whose land entitlement depended on royal degrees. Usually this was done by imposing labour obligations on male and also female cultivators (Yoder, 1986; Regmi, 1999 [1977]; Aubriot, 2004). The *Muluki Ain* of 1854 strengthened these and other customary practices in relation to irrigation.

In these circumstances, everyday operation and management of irrigation was an affair of farmers in which (higher) state authorities were not involved (P. Pradhan, 1989; Shivakoti and Ostrom, 2002). Nepal's rugged terrain provides a partial explanation why agriculture and irrigation was practised *de facto* in isolated conditions. The royal court in Kathmandu never really had the resources and ambition to administer daily life at the district level, let alone irrigation management at the village level. The royal court was primarily organized for military conquest and later transformed into an administration for maintaining law and order, aiming to extract a maximum amount of revenue from (irrigated) agriculture, mining and forest exploitation (Caplan, 1975; Bajracharya, 1983; Stiller, 1993). The size of the ruling class involved in this was small and consisting approximately out of 200 to 300 families (Shumshere, 1971; Regmi, 1999 [1977]). In case rulers engaged with irrigation, it was through middle men and tax collectors to squeeze more rents or labour out of cultivators. Scarcity of labour was the limiting factor for bringing more land into production, and the total irrigated area in Nepal did not exceed 200.000 ha around 1950 (see Figure 2.1 below). Most of the community irrigation systems that exist today have been constructed after 1940. Since then the population started to increase (see Figure 2.1) and in the 1950s, 60s and 70s, land became available in the Terai for Hill migrants after the eradication of malaria (Elder, 1975; Mathema, 1999). Irrigation governance in most areas in Nepal was thus an affair of farmers deep into the twentieth century, sanctioned by the state through taxation.

2.2.2 Self-governance and basic needs policies (1980s onwards)

The mosaic of institutional arrangements that existed in the communities, and between the communities and the state, for the governance of these systems, was captured in international irrigation policy circles in the 1980s in the generic term 'farmer managed irrigation systems' (FMIS) (Martin and Yoder, 1983; Coward and Levine, 1987; P. Pradhan, 1989). Initially, FMIS was an empirical term to describe irrigation realities in Nepal, but the term also became an abbreviation (or idea) for a new policy approach of public intervention in the irrigation sector (IIMI/WECS, 1987). In 1981, it was estimated that no less than 80% of the irrigated area in Nepal fell under so called 'non-assisted' irrigated areas or FMIS systems (WECS, 1981) (see 'non-assisted area' in Figure 2.1). In an effort to boost agricultural productivity, empower the rural poor and decentralize the government, fiscally and administratively, irrigation programming and the related support of the WB and the ADB shifted to the rehabilitation and expansion of FMIS irrigation under 'basic needs' policies (HMG-N, 1988). These policies aimed to improve the living conditions of rural people in Nepal for human dignity according to Asian standards (ADB/APROSC, 1990: 80). To meet the targets, a total area of 1.250.000 ha was envisioned for irrigation development. The new irrigation programmes focussed on the rehabilitation of FMIS systems, because modern, state-initiated irrigation development had proven to be very expensive and had produced disappointing results (see below). Two important programmes were the WB supported Irrigation Line of Credit (ILC) in West Nepal (starting in 1988 for an area of 150.200 ha), and the ADB supported Irrigation Sector Programme (ISP) in Central and East Nepal (starting in 1989 for 33.000 ha) (Shukla *et al.*, 2002). These and consecutive irrigation projects radically changed the governance of FMIS irrigation, creating new ties of administration between farmers and the state.

Figure 2.1: Population growth and irrigation development in Nepal



Source: See Annex 4.

Common prescriptions for rehabilitation works were headwork improvement and canal lining, aiming to improve efficiency of water use. FMIS systems typically had temporary structures, which required high (male or female) labour input for annual re-construction and maintenance. This appeared 'inefficient' but the need to manage labour collectively provided for strong incentives among farmers to organize (P. Pradhan, 1989). It also made the system flexible and adaptable to changing circumstances. The rehabilitation programmes fixed the physical outlay of the systems, and with it, they also fixed and standardized the enormously diverse institutional arrangements in the systems. More specifically, the FMIS programmes imposed standard criteria for the organization of a formal WUA and made legal registration of the WUA compulsory. The latter was made mandatory for farmers to make a 'demand' for government assistance. The rehabilitation programmes were supposed to include projects only after a 'request' of water users and the new WUA had to enter into an agreement with the DOI, stipulating the cost-sharing of the project (Shukla *et al*., 2002). These procedures were alien to the existing forms of organisation in FMIS and fundamentally changed the governance of irrigation, politically and culturally. Previously, village leaders played an important role in the organisation of irrigation as they were often also low-level state dignitaries or revenue functionaries. In this context, the position of the cultivator in irrigation in relation to the state was that of a hard-pressed, anonymous taxpayer. Under the FMIS rehabilitation programmes of the DOI and other agencies, farmers were gradually brought under the ambit of the central state administration as 'beneficiaries'. These developments also had their impact on the position of the Irrigation Engineer, because project development now relied (fully) on the active involvement and participation of users.

Today, there is still a significant area of FMIS in Nepal that has not received government assistance (yet), approximately 300.000 ha (DOI/CERD, 2007; ADB, 2012a). However, most FMIS are now operated under completely altered relations with the state and under (more) intense ties with government agencies like the DOI. Through assistance and the formalization of WUAs, direct relations between the farmers and the government administrators have been established. It is no longer an exception to find so-called 'FMIS systems' in Nepal operating under an aid regime of technical assistance of the government (Liebrand and Yakami, 2011; Liebrand and Singh, 2012; Singh *et al*., 2014). As a result, the irrigated area under FMIS, defined in Figure 2.1 as the 'non-assisted area', has gradually declined since the 1990s.

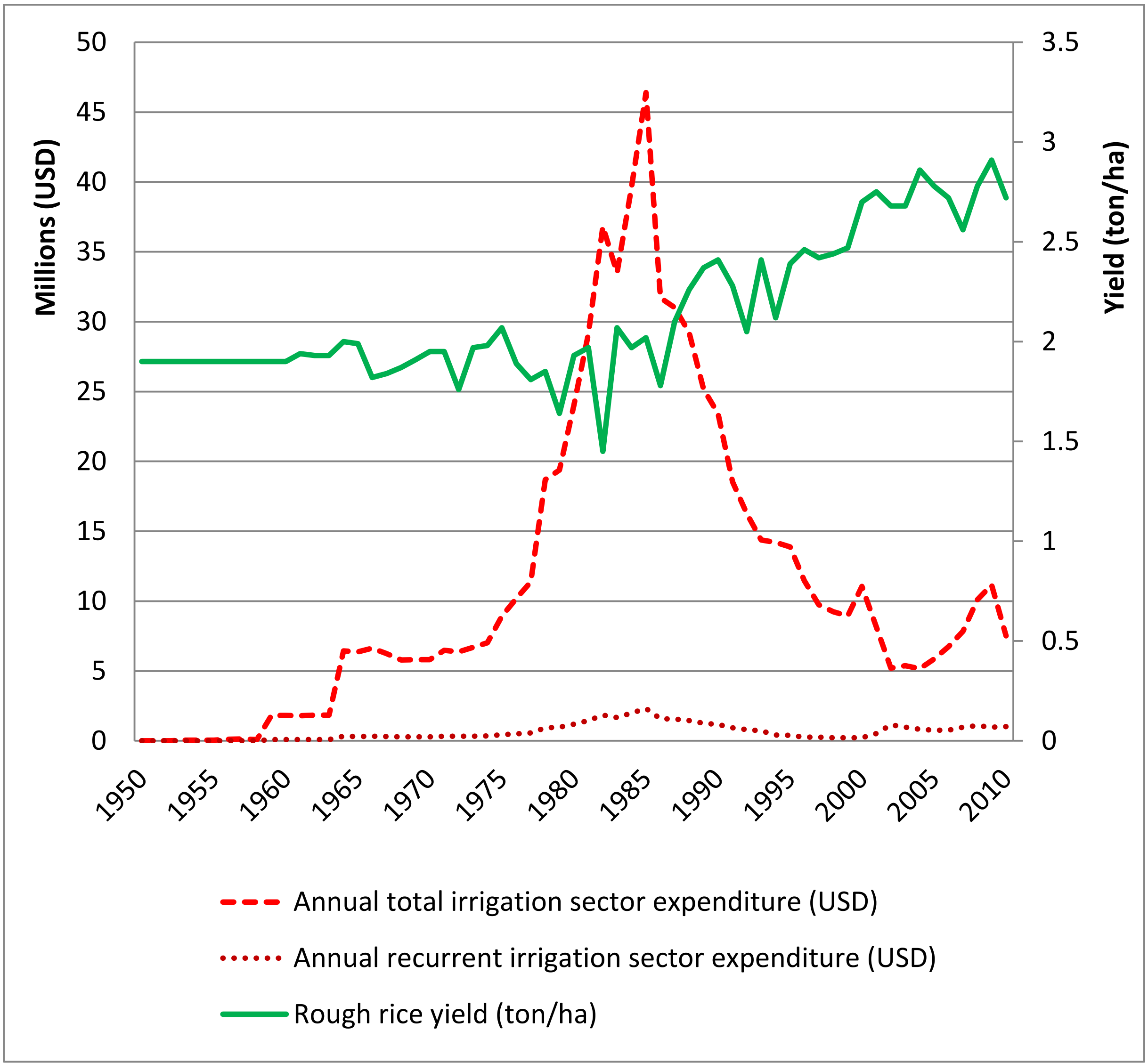
2.2.3 New ideals, civil works and the state bureaucracy (1920s onwards)

Involvement of the government in irrigation infrastructure development began in the 1920s. The first irrigation system constructed in Nepal was the Chandra Canal (East Nepal). Construction started in 1923 under the supervision of a British engineer. In the period 1932-1950, a few more irrigation canal and dam projects were developed under supervision of Indian engineers, and a small public works department was established in 1934 (Shukla and

Sharma, 1997). In the late 1940s, some Rana administrators started to conceptualize projects for ‘integrated water resources development’ in Nepal, inspired by irrigation works in India and the Tennessee Valley Authority (TVA) in the US (Pandey, 1988). The Kosi river (East Nepal) was an important place for new plans to regulate the water flow for multi-purpose river development. Investigations started in the 1940s by Indian engineers, and in 1954, an agreement was signed between the government of Nepal and India on water use in the river (B.K. Pradhan, 2009). In 1959, there followed an agreement between Nepal and India for the Gandaki river (or Narayani river). Under these agreements, India constructed two barrages on Nepalese soil for hydropower generation, flood control and diversion of water for irrigation in Nepal and India (Utter Pradesh and Bihar), respectively in 1959-63 and 1968-69 for the Kosi and the Gandaki project. In the 1960s and 70s, India also constructed the irrigation canals in the Nepalese Terai for the irrigation components of these projects (Poudel, 1986).

Nepalese public officials and engineers had no significant role in the making of the Kosi and Gandaki treaties, an important reason why they are considered unfair in Nepal as they are perceived to benefit India more than Nepal (Gyawali, 2001; Dhungel and Pun, 2009). In the 1950s and 60s, irrigation development was mainly an affair of Indian engineers. Illustratively, India (also) advised Nepal on the set-up of a Canal Department in 1952 – the predecessor of the DOI – headed for the first years by a retired Indian engineer from the Punjab (DOI, 2008). The department largely relied on Indian aid, marking the new post-colonial relation between the countries (Maskey, 1978; B.B. Pradhan, 1982). With the fall of the Rana regime in 1951, the government of Nepal made a proclaimed effort to develop Nepal into a modern state. The construction of infrastructure played an important role and irrigation development was considered vital for the welfare of the nation (Sharma, 2004). The mandate of the Canal Department was the implementation of irrigation canals with the goal to increase agricultural productivity and ‘counter’ population growth (Theuvenet, 1953; UN, 1961). In its most basic elements, the rationale of this ‘irrigation engineering vision’ is presented in Figure 2.1. It shows the scale of population growth and the scale of area developed for irrigation. The rationale of this vision is that irrigation engineering is critical to avert a national crisis and make Nepal a prosperous nation (UN, 1961; WECS, 1981; DOI, 2011). Figure 2.1 illustrates that rapid population growth in Nepal has always formed a sustained legitimate ground for the government to expand the irrigated area and intervene in existing FMIS systems.

Figure 2.2: Public irrigation expenditure and agricultural productivity in Nepal



Source: Annex 5.

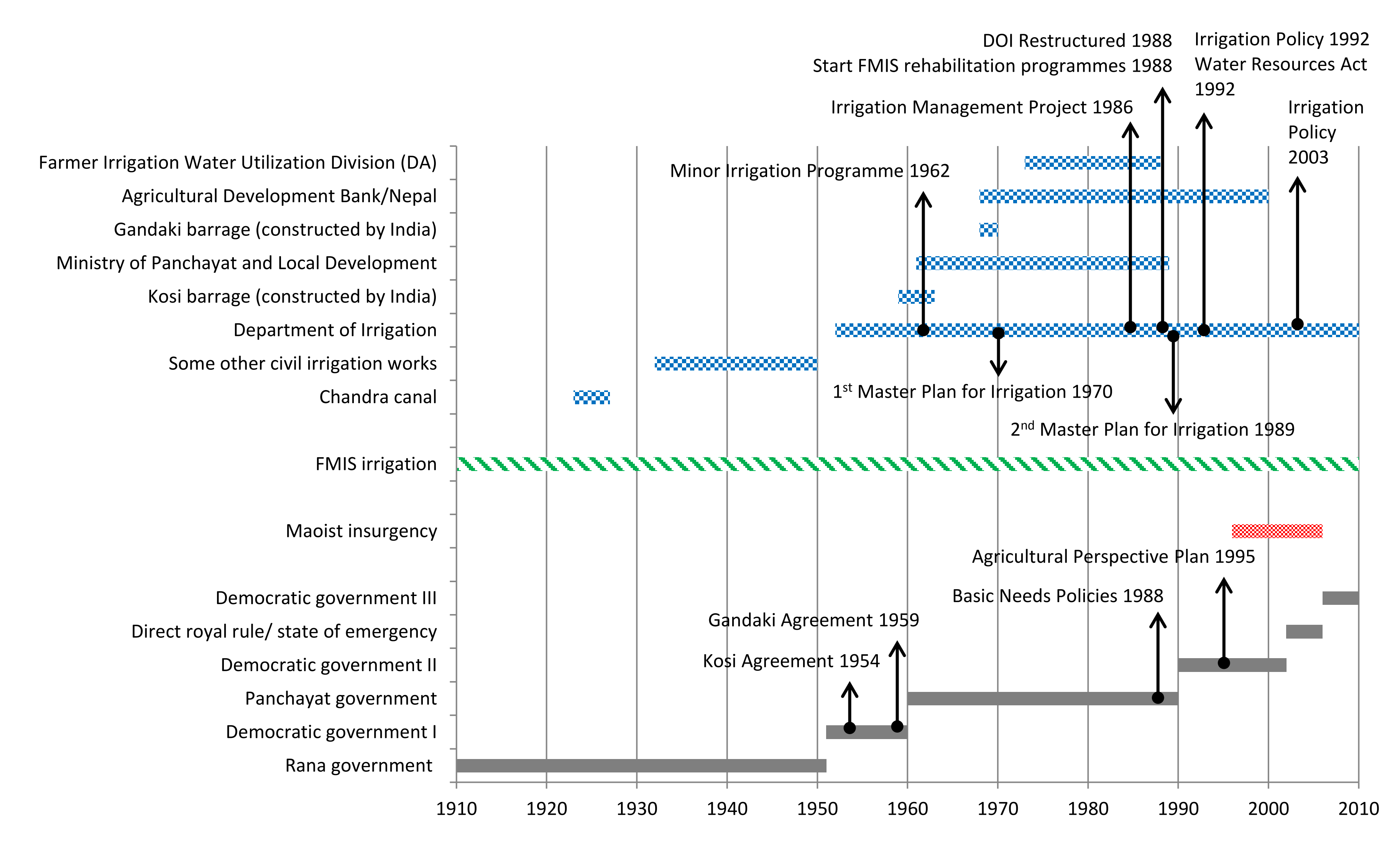
In the rationale of irrigation engineering vision, the state and the engineers of the DOI are the principal agency for irrigation development. The vision defines the 'irrigation sector' as a specialist field of development, treated as a separate budget line in national planning and delineated from the agricultural – and drinking water sectors. The ultimate goal of the irrigation engineering vision is to raise agricultural productivity. Figure 2.2 illustrates public expenditure on irrigation development and agricultural productivity in Nepal for the period 1950-2010, taking the FAO figures of 'rough rice yield' as a reference. It shows that public irrigation expenditure peaked in the 1980s like elsewhere in Asia (Faurès *et al*., 2007; Suhardiman and Mollinga, 2012). These sums of money allowed the DOI – then called the Department of Irrigation, Hydrology and Meteorology (DIHM) – to grow into a full-size water bureaucracy, staffed by civil engineers whose careers and reputations became linked to irrigation and water resources development (Udas and Zwarteveen, 2010). The scale of agricultural productivity shows that the yield of rice (measured at the national level), has increased from approximately 2 to 3 ton/ha during the last three decades. A direct relation of impact between public expenditure on irrigation and agricultural productivity may not be directly evident, but it illustrates that a gradual rise of productivity (or rather the lack of more substantial increases) has formed a sustained legitimate ground for the government to pursue state-led, irrigation development in Nepal. More specifically, the ‘slow’ increase of agricultural productivity in relation to population growth provides to date for an argument to defend a culture of ‘building things’ in irrigation and advocate for new project development – over the need for system operation and maintenance. Figure 2.2 shows that 90% of public expenditure on irrigation is allocated for so-called ‘capital budgets’ or project development and less than 10% for so-called ‘recurrent budgets’ or system operation and maintenance.

An example of the irrigation engineering vision in Nepal is presented in Figure 2.3. It presents a map of Nepal, showing ‘irrigable’ and ‘non-irrigable’ (or rather ‘engineerable’ and ‘non-engineerable’) areas in the country. The map is taken from the ‘Master plan for irrigation development in Nepal’ of 1989 (DOI/WB/UNDP, 1989). As can be seen, the most promising irrigable areas in Nepal are identified to overlap with the districts that fall into the ecological zone of the Terai. The map provides a visually rich snapshot of the irrigation engineering vision in Nepal. It visualizes a national ‘technical upper limit’ for irrigation development, based on an assessment of available land and water resources (DOI/WB/UNDP, 1989: 88). The potential for irrigation engineering presented in the map constitutes the core mission of the Irrigation Engineer and other members in the COP of the Irrigation Organisation, informing policy and practice in irrigation development (Dhungel and Pun, 2009; DOI, 2011).

Figure 2.3: Distribution of irrigable land in Nepal

Source: DOI/WB/UNDP, 1989

Figure 2.4: Time line of some important events in Nepal



Source: Made by the author. DA = Department of Agriculture.

2.2.4 Competing interests and modes of irrigation management (1980s onwards)

The actual implementation of the irrigation engineering vision, as presented in Figure 2.3, has a chequered history in Nepal. In spite of all intentions, goals for irrigation development have been scaled down from the start. In the 1950s and 60s, the government did not have the financial and technical resources to execute big irrigation projects, nor were donors prepared to provide these resources. Furthermore, the build-up of the public administration went accompanied with competition for positions, mandates and budgets. More specifically, engineers of the DOI had to compete for spheres of influence with agriculturalists of the DA and its Farmer Irrigation and Water Utilization Division (FIWUD), and other organisations like the Agricultural Development Bank of Nepal (ADB-N). Illustratively, the first national irrigation programme in Nepal in the 1960s, funded by India, the 'Minor Irrigation Programme', was initially supervised by the DA (Koirala, 5 January 1967). It aimed to develop quick yielding irrigation facilities by 'harnessing' small rivers. The programme imposed budgetary ceilings of USD 10.000, directed financial resources through the district committees and relied on voluntary labour of (male) beneficiaries for construction (WECS, 1981; Sharma, 2004). Such a programme stood far from a vision of centrally administered, irrigation development by engineers, but its approach was a success – simple irrigation infrastructure development, decentralized project management and labour contribution of beneficiaries (Sharma, 2004). This approach became the trade mark for small-scale irrigation development of the FIWUD, the ADB-N and the Ministry of Panchayat and Local Development (MPLD), a model for irrigation development that engineers of the DOI and other members in the COP of the Irrigation Organisation continuously had to engage with.

In the late 1960s, multilateral lending agencies like the WB and the ADB became active in Nepal, and the role of India as the prime financer of irrigation development diminished (B.B. Pradhan, 1982). In addition, the UN provided assistance in water resources surveys to assess the hydropower and irrigation potential of the country (Rising Nepal, 29 March 1967). These studies and the involvement of foreign donors resulted in the first 'Master Plan of Irrigation Development in Nepal' (HMG-N, 1970b). The plan strengthened the position of the Irrigation Engineer and this time, funds were made available to implement big irrigation projects (Poudel, 1986). The 1970s and 80s were the heydays of large-scale, public irrigation development in Nepal, but the outcome of it proved to be disappointing. The projects were capital intensive, implementation was sluggish and the desired increase of agricultural productivity was not realized. The situation was aggravated by an international oil crisis in the 1970s, resulting in serious balance of payment problems for the government (WECS, 1981). Nepal could not meet its loan obligations and public irrigation development was critically scrutinized in the background of rapid population growth, falling land productivity and stagnant levels of food production (HMG-N/FAO, 1976; APROSC/ADC, 1978). These events marked the end of the welfare approach in development and the beginning of the neo-liberal aid regime (Guthman, 1997). New projects had now to be cost-efficient; the focus shifted to decentralized management, and an explicit aim was to mobilize resources among users.

In this context, the management and rehabilitation of community systems – FMIS irrigation – was promoted in policy circles as a cost-efficient approach for irrigation development. Essentially, the 'FMIS approach' for irrigation governance was not new (the projects of the FIWUD, ADB-N and MPLD already relied on farmers' contributions and user involvement), but it was now also considered applicable for irrigation development as pursued by the DOI. The focus on irrigation development shifted to the Hills, seen as a 'backward' area first, but now (also) as a potential place for public interventions in irrigation (IIMI/WECS, 1987). The FMIS approach became a new model for the DOI to experiment with new forms of user participation and project management in public irrigation. In 1986, the DOI started the 'Irrigation Management Project', supported by the United States Agency for International Development (USAID) (Shukla and Sharma, 1997). The outcome was new policies of PIM and Irrigation Management Transfer (IMT), institutionalised in the irrigation policies of 1992 and 2003, and also in the Water Resources Act of 1992. The first public irrigation systems were handed over to user committees in the 1990s (Khanal, 2003). Like in FMIS systems, these policies formalized the relation between the state and farmers through the registration of WUAs. The PIM and IMT policies are still active in Nepal, even though recent research suggests that claims on state resources increase rather than decline as a result of these policies (Garces-Restrepo *et al*., 2007; Mukherji *et al*., 2009a; 2009b). One reason to continue with them is that users' participation is not only justified on economic grounds, but is also meant to address inequities and achieve higher levels of inclusion for disadvantaged groups (women, ethnic minorities, people of 'low caste') (DFID/WB, 2006; Udas and Zwarteveen, 2010).

Government programmes on irrigation include now a wide range of activities: new system construction, FMIS rehabilitation, groundwater development, PIM/IMT and more recently, the implementation of micro irrigation technology (drip and sprinkler irrigation, treadle pumps, tanks). In the late 1980s, all 'irrigation components' in the government, particularly those of the FIWUD and MPLD, came to fall under the mandate of the DOI, while the ADB-N scaled down its programme on subsidized irrigation development. Since then, the DOI has the position of the lead agency in the irrigation sector. The Agricultural Perspective Plan of 1995, a twenty-year development strategy of the NPC, renewed the mandate of the DOI, and defined irrigation as the top priority for investments in the agricultural sector (NPC, 1995). Foreign donors no longer have their personnel directly involved in irrigation projects, and most funding for irrigation development, notably of the WB and the ADB, is channelled through programmes in which the DOI has a big stake. These developments have allowed the Irrigation Engineer to secure the identity of the DOI as an engineering organization, defining the construction of big irrigation and water resources development projects as the ultimate goal of the agency (DOI, 2011). This is not to say that the Irrigation Engineer is still the traditional 'technocrat' of the 1970s and 80s – to the extent that was ever a case in Nepal. Since the 1990s, project budget approval importantly relies on formal agreement on cost sharing between the government and project beneficiaries. To make this work, the Irrigation Engineer works extensively with farmers and social organisers in project execution, and is constantly challenged to (re)think technology development in the profession (Khanal, 2003).

2.3 The education system and the civil service in Nepal (1950s onwards)

This analysis goes back to the 1950s when modern forms of education and a modern civil service were established in Nepal. The focus is on the gendered aspects of these institutions and the roadways that are available in these institutions for making a career in irrigation.

2.3.1 The education system

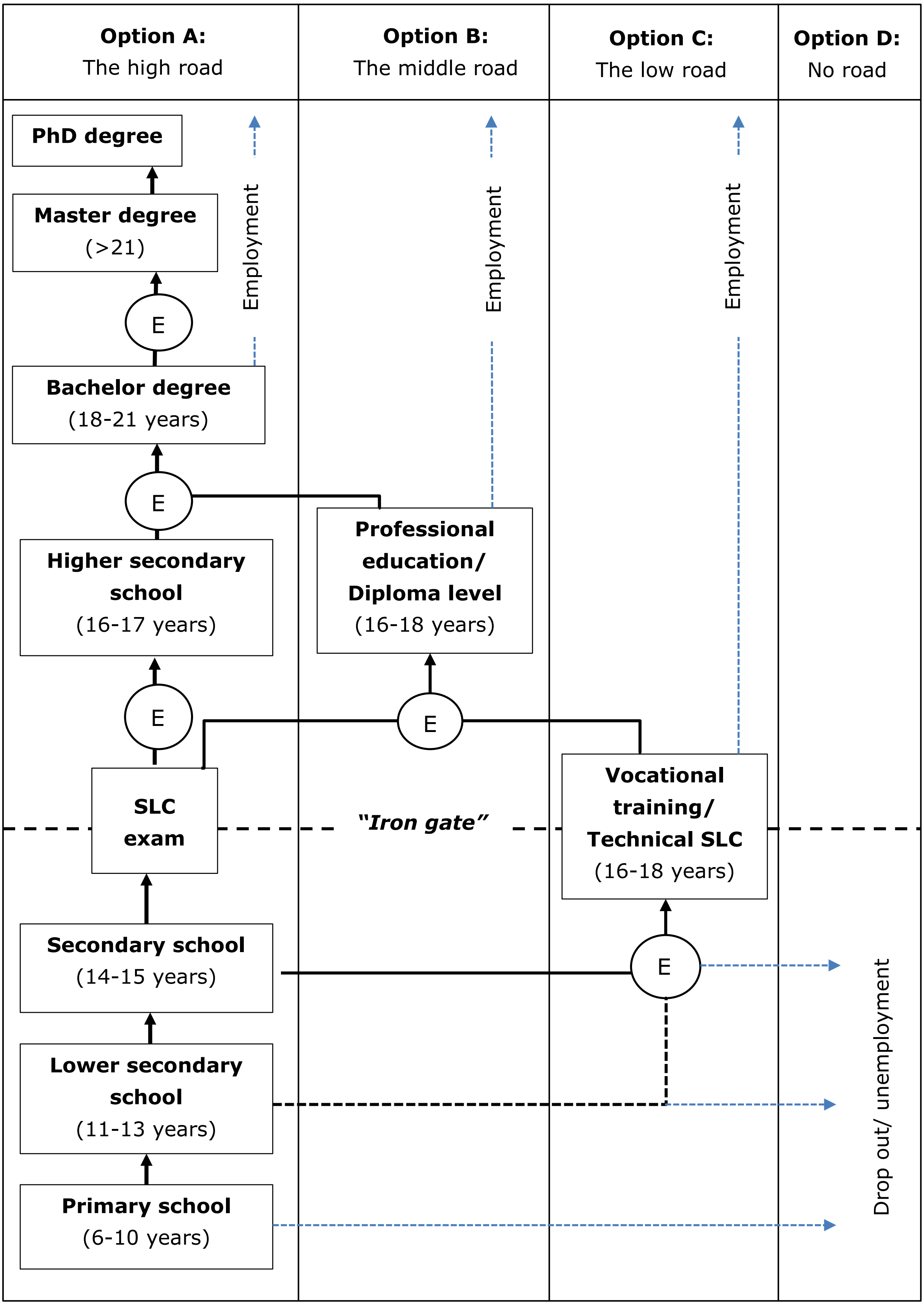
Before 1951, modern forms of education were treated by the Ranas as a threat and these were restricted as part of a general policy of isolationism. The few schools that existed were meant to educate the children of the Kathmandu elite (Skerry *et al*., 1992: 54-55). Durbar High school was established in 1892 and Tri-Chandra college in 1918, respectively marking the start of secondary and higher education in Nepal. For higher studies, some members of the Rana elite were sent abroad. In the 1930s, the Ranas made available the first scholarships for bachelor degree education in India in an effort to modernize the country (Stiller and Yadav, 1978). In 1951, with the appearance of the first foreign donors in Nepal, there were only about 300 college graduates and 20 trained teachers in the entire country. Approximately 98% of the 8 million people in Nepal was illiterate (Skerry *et al*., 1992: 6).

The new constitution of 1951 conceived education as a 'basic right' (Stiller and Yadav, 1978), essential for the spread of 'common language and a sense of national identity', and for providing 'basic literacy and the skills and attitudes needed to forge a modern unified nation' (Skerry *et al*., 1992: 55). The first five-year plan for education of 1956 foresaw in the establishment of Tribhuvan University in 1959, the first national university of Nepal, funded by the United States (US) and the Ford Foundation. In the 1950s and 60s, the US and India acted as the main donors for setting up an education system. The US focussed on basic and vocational education, primarily for agriculture and community development, and India focussed on engineering education (Skerry *et al*., 1992; Bhattarai, 2009). Notably, in 1957, the United States Operation Mission (USOM, now USAID) set up a school in Chitwan District to train junior agriculturalists. This school became the IAAS in 1972, part of Tribhuvan University (IAAS, 2007). In the late 1980s and 90s, the IAAS played an important role in irrigation governance in Nepal (see Chapter 7). In these early years of education in Nepal, scholarships for Nepalese students and administrators to follow studies abroad were part and parcel of aid relations (Stiller and Yadav, 1978).

The diversity of donor initiatives – primary and secondary schools, teacher training, adult literacy, radio education, library development, scholarships – prevented the standardization of education, a recurrent concern of the national elite. There was no uniformity, except for the decision to adopt the Indian model of central accreditation in higher education in 1959, taken amidst Indian concerns that Nepal would opt for the US model of autonomous universities (Skerry *et al*., 1992: 66). Eventually, king Mahendra embarked on a programme of national education reform, premised on the perceived necessity of regaining the neglected 'essential characteristics of all strong states – national pride, virility and individuality' (Onta, 1996: 217 cited in Tamang, 2002: 315). Reducing donor assistance and foreign influence in education was an important objective. In 1971, the 'National Education System Plan' (NESP) was launched determinedly after none of the 25 donors consulted for the plan had come forward with support (Skerry *et al*., 1992: 233).

The NESP envisioned 'education for all'. It foresaw in a heavily subsidized, centralized national education system, introduced Nepalese as the national language, made the teaching of national history (*Rastriya ithihas*) compulsory, and presented a uniform, government prepared curriculum and syllabus (Stiller and Yadav, 1978; Mallioux, 1981). The implementation of the plan – covering schools in 75 districts – went slowly but its structure basically stands today. Only some changes have occurred. The national history is no longer compulsory (after 1990) and other languages are now allowed in the classroom (DFID/WB, 2006). The system produces four roadways for children to pursue education, conceptualized in this thesis as: (a) the high road – academic education in the form of bachelor and master degrees; (b) the middle road – professional education at the diploma level; (c) the low road – basic vocational training equivalent or higher than the level of secondary school exams; and (d) no road – drop out of school. Figure 2.5 presents how these roadways are linked. Key to the national education system is the centrally administered 'School Leaving Certificate' (SLC), taken at the end of the secondary school, when children are 15 or 16 years old. Among the compulsory courses are English, science and mathematics. Passing the SLC exam is critical for further education on the high and middle road – the focus in this chapter – and is known in the education system of Nepal as the 'iron gate'.

Figure 2.5: Roadways in education in Nepal



Source: My illustration based on IOE, 2005. Abbreviations: SLC = School Leaving Certificate (SLC), and E = Entrance exams.

Public primary education has expanded enormously since the 1970s, from 7.256 schools catering to over 100.000 students in 1970 to 27.525 primary schools serving over 4,5 million children in 2007 (Bhatta, 2005; Bhattarai, 2009). However, the quality did not keep up with the numbers (See Annex 6 for an overview). A centralized bureaucracy trying to oversee the vast network of schools and the structural political interference in the hiring of teachers, results in schools having only 17% of trained primary-level teachers, text books arriving late in the school year and teachers often not showing up in the classrooms (DFID/WB, 2006: 76). Public school education was perceived as being poor of quality, with rates for passing SLC exams of less than 15%. Parents who have the resources – members in the COP of the National Elite – place their children in private schools, located mostly in the Kathmandu valley, where the rates for passing SLC exams are 85% (DFID/WB, 2006).

The education system in Nepal operates basically as a closed system of the COP of the National Elite, in spite of recent acts to decentralize education (2001) and policies to make education more inclusive, such as the 'Nepal Education For All' plan of 2003 (DFID/WB, 2006). Access to education continues to reflect class, caste, ethnic and gender divisions in society. Overall, 52% of the Nepalese population does not speak Nepali as their mother tongue and this puts non-Nepali speakers, such as many Janajati in the Hills and Hindi, Maithilli or Bhojpuri speakers in the Terai, at a disadvantage in terms of access to education. There exists also a close relation between the gender, and caste and ethnic background of teachers and the students. Primary school teachers tend to be male, attracting mainly male students, while schools with more female teachers tend to attract more female students, and schools with Janajati and Dalit staff attract more enrolment of children from these social groups. Yet, only 30% of primary school teachers are women (Bhattarai, 2009), heavily concentrated in urban areas, and the majority of the teachers are from the B/C castes, while there are only 2% Dalit teachers for example (DFID/WB, 2006: 80).

Evidently, when studying masculinities in engineering education in Nepal – the high and middle road – it is thus important to note, first, that education in general was meant to invoke students with a sense of nationalism and is seen as a source of social cohesion, and second, that the highest degree of exclusion occurs at the level of primary and secondary schools, as children drop out or fail to pass the SLC exams. This is particularly true for boys and girls in remote areas who often come from ethnic minorities, and for girls in general, also for girls with an upper-caste background. The following quote from a study report of 1996 on the professional development opportunities for women in Nepal aptly illustrates the situation: '[The majority] of [the] respondents expressed the view that socio-cultural perceptions and a traditionally conservative attitude to women is the major factor hindering women's access to educational opportunities. Women's responsibilities are generally considered to be centred and visible at household level, whereas men are regarded as 'earners' and 'bread-winners'. As a result, males are given priority in schooling and higher education. Expenditures on [male] education [is] generally considered an investment for future livelihood support of the family, whereas girls are supposed to leave the family after marriage and thus less attention is given to their education. Several surveys revealed that parents are asked as to why they are not sending their girl children to school, one of the repeated answers is "they will go to [the] other people's house, so what is the use of educating them"' (WECS/BCESC, 1996: 12).

In addition, the national education system standardizes grade divisions for the SLC exams – distinction, first, second, and third division, fail – adding an element of competitive ranking among students. The grade of the SLC exam determines whether a student is eligible to participate in entrance exams for higher education, and those exams themselves produce a ranking to determine who is eventually allowed to enter the university or college. These entrance exams pose another hurdle for students of disadvantaged groups in society as they tend to have lower grades for their SLC exam. In this context, it is no surprise that men from the Kathmandu-based B/C castes and Newar people dominate the ranks of engineering education. A complex quota and scholarship allocation system for about 10% of the total seats in education, for categories like women, Janajati, Dalits and students from remote areas and public schools, has failed to make (higher) education more accessible for these groups.

Since the mid-1980s, there has occurred a growth in higher education in Nepal. New public universities were set up, notably Kathmandu University (1991), Purbanchal University (1993) and Pokhara University (1997). In addition, there has been an explosive growth of private colleges for higher education after the fall of the Panchayat government. By now, there are over 520 institutions for 'university education' in Nepal of which only 16% are public institutions (Bhattarai, 2009). In spite of this growth, Nepalese students prefer going abroad for higher education, particularly for master and PhD degrees, as the quality of domestic education is not considered up to international standards. Generally, primary education has thus become accessible for most Nepalese people, including for (high-class) girls, but this has mainly created a situation of educated mass unemployment as the economy nor the state bureaucracy has been able to absorb the students (Kamarcharya *et al*., 2003; Devkota, 2003).

2.3.2 The civil service

The public sector in Nepal basically comprises three sub-sectors: the central government, local and municipal authorities and state-owned enterprises (Poudyal, 2009). The analysis in this thesis focusses on the administration of the central government, known as the civil service. The civil service in Nepal, as it exists today, was created in the 1950s, modelled after the Indian civil service, which in turn was a product of the British colonial administrative system (Stiller and Yadav, 1978: Shrestha, 2001). A batch of some five top Indian civil servants were associated with the process. They advised on drafting the interim constitution of

Nepal in 1951, helped in the organization of the 'Central Secretariat' in Singha Durbar (the palace of the Ranas) and they drew up broad instructions for office procedures (Shrestha, 2001). They also advised Nepal in 1952 on the set-up of a 'Public Service Commission' (PSC) for the recruitment of civil servants and in 1957 they proposed a structure for the 'Nepal Administrative Service', dividing the civil service in specific service categories. One of these services is the 'Nepal Engineering Service' (see Annex 7 for all administrative services in Nepal). The structure of the civil service, as laid out by Indians in the 1950s, basically stands today.

On paper, the organisation of the central government follows the Weberian, rational-legal design: political neutrality, hierarchical composition, specialized tasks and knowledge, formal communication and record management, and objective standards and impersonal rules that ensure organizational reliability and predictability (Keith, 1985). In practice, however, the civil service in Nepal inherited many practices from the Rana administration. The government of the Ranas had a strong feudal base and was organized on principles of kinship and patronage (Caplan, 1965; Shumshere, 1971; Whelpton, 2005). It was characterized by favouritism, nepotism and a highly personalized administrative culture. Many of the practices associated with this culture have survived in some form, and recruitment and promotion has continued to occur by principles of patronage – not merit (Bista, 1991; Shrestha, 2001). Common informal practices in the civil service are described in Textbox 2.1.

In 1956, the first Civil Service Act was promulgated. The act classifies civil servants in two broad categories, the gazetted class and non-gazetted class. Appointments, transfers and promotions in relation to gazetted positions are notified in the government gazette, hence the name 'gazetted class' (Shrestha, 2001: 46). Gazetted officers are recruited by the PSC and they are considered responsible to drive the government mission of national development. Non-gazetted officers are appointed by the head of the department to support gazetted officers, and classless officers are support staff (Udas and Zwarteveen, 2010). Each class is subdivided in ranks. For instance, the gazetted category consists of third, second, first and special class positions (see Table 2.1). Apart from these categories, there is made a distinction between permanent and temporary employment in the civil service. Temporary service can be terminated any time, and these employees, usually low-level officers, have hardly any career prospects in the civil service (DHV/APROSC/WB, 1989). This system produces a number of career opportunities or roadways in the civil service – two are significant for this thesis. First, junior officers with a bachelor degree are recruited by the PSC for gazetted third-class positions (see the 'roadway of engineers' in Table 2.1). In their career, they often make one or two times promotion before retirement, respectively to second and first class positions. Second, junior officers with a diploma are recruited by the department for non-gazetted first-class positions (see the 'roadway of overseers' in Table 2.1). In their career, they often make one promotion to gazetted third-class positions. These roadways are situated within the boundaries of an administrative service (e.g. engineering service, agricultural service, judicial service, education service). In other words, an officer in the civil service will always be an engineer or overseer once recruited as an engineer or overseer.

Table 2.1: Roadways in the civil service in Nepal

Description (example: DOI)	**Gazetted class**	**Non-gazetted class**	**Classless**
Ministers, secretaries	Special	Roadway of engineers	
Secretaries, DG, head of division	1st		
Head of district office, head of project	2nd		
Project engineers	3rd		
Project overseers, technicians		1st	
Administration, social organisers	Roadway of overseers	2nd	
Administration, gate operators		3rd	
Peon, cleaning staff			Classless

Under the Panchayat government, in the 1960s and 70s, the civil service increasingly grew into a static and inefficient organisation (Skerry *et al*., 1992: 99). This process was facilitated through the massive inflow of foreign assistance (Tamang, 2002). Donors typically made assistance contingent upon the governments acceptance of administrative reform programmes, but at the same time, they grossly overtaxed the government's scarce administrative and technical resources, feeding into practices of favouritism and corruption to 'get things done'. This situation persists today. Many foreign-aid programmes, with the related allocation of capital budgets for project development, can hardly be digested by the Nepalese public administration, at least not within the designated timeframes. This provides a ground for corruption. As a senior engineer and public servant explained to me; 'the money needs to go somewhere' (field notes, May 2010). It is no exaggeration to say that the introduction of modern forms of corruption in the civil service coincided with the introduction of foreign aid in Nepal (Panday, 2009 [1999]).

Textbox 2.1: Informal practices in the civil service of Nepal

Chakari: A manifestation of patronage in Nepal of institutionalized flattery. The practice was institutionalized in the 19^{th} century at the court of the Ranas, meaning to 'wait upon, to serve, or seek favour from god' (MOFA, 1998: 37). Potential competitors of the Ranas were forced to be constantly visible and spy on each other by attending the most powerful rulers daily. Later, government employees had to perform chakari to ensure job security and in order to be legible for promotion. Today, chakari persists as a practice of pleasing the patron or boss through the show of physical presence, waiting and making courtesy calls at 'his' home or at the office. At some point, the superior is forced to recognize the loyalty and servile courtship of subordinates, leading to actions that 'he' would normally not perform and that are not in the best interest to the organisation (Bista, 1991).

Afno manchhe: It literally means 'one's own people' (MOFA, 1998: 37). Afno manchhe draws a sharp line between 'us' and 'them', between those who are loyal and trustworthy, and to whom one has no responsibilities. It is a term used to designate one's inner circle of associates and refers to those who can be approached whenever need arises. Important attributes of afno manchhe are family connections, loyalty to particular persons, affiliation to a political party as well as bribery and 'commissions'. Afno manchhe connections are critical for making things happen in the government: it helps to open doors, obtain information, complete paper work, speed up files for approval or resolve a conflict.

Source force: A modern form of afno manchhe. 'Source' refers to a contact (friend, relative, colleague) and 'force' refers to the relative power of one's contact (Stiller and Yadav, 1978: 108-109). Source force is a belief that every rule or law can be bent to one's purpose if an adequate contact is at hand. It is believed what makes the system function. Source force is universally applied in Nepal for employment, promotion, transfer, scholarship, training, study tour, and in almost any activity of life (MOFA, 1998: 38).

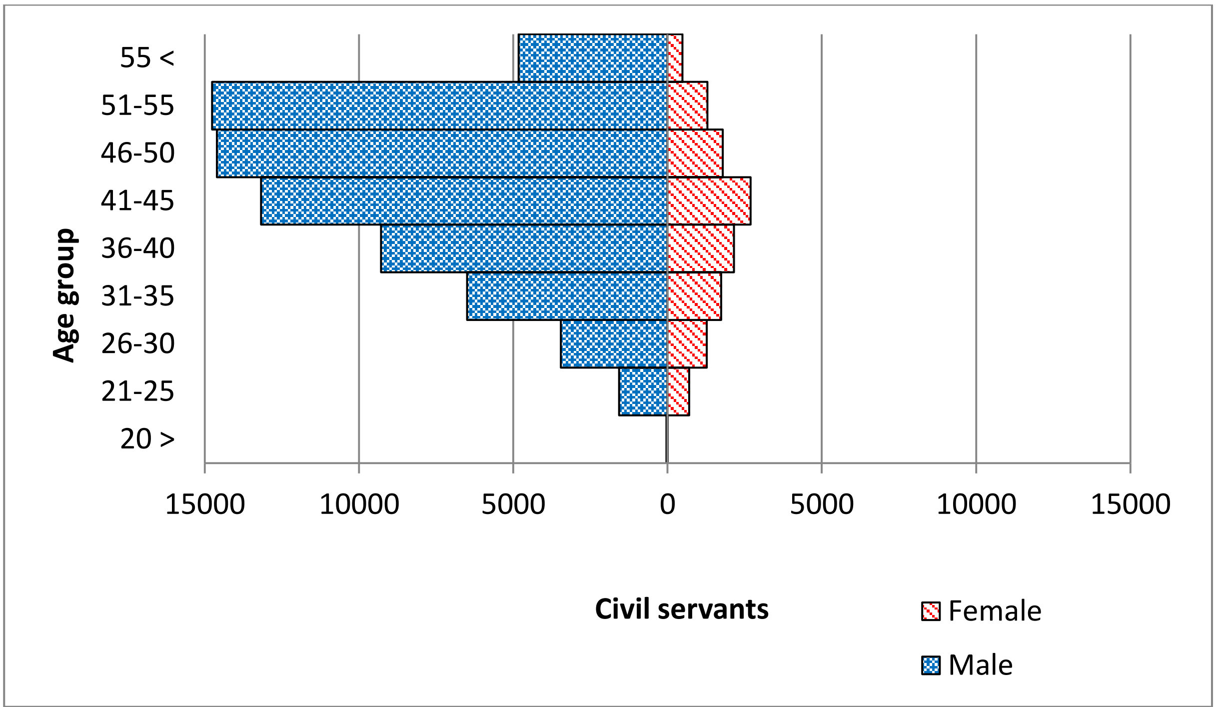
The *tipani* system: Tipani means a written comment in a government file (Dangal, 2005). Nepalese officials inherited from the Indians a respect for files (Stiller and Yadav, 1978: 92). An administrator directs matters for higher decision which fall outside 'his' jurisdiction. This process starts by a letter of a low-level officer, stating the problem, identifying difficulties and proposing a solution. Then, the file is sent to 'his' superior who comments on it in writing (tipani). This process continues until the file reaches an officer who is empowered to take a decision. At this stage, the file might be half a meter thick, full with handwritten notes and decorated with official seals. This system allows for practices of favouritism and bribery, and provides a perfect excuse for not taking action when action is considered inconvenient, distasteful or embarrassing (Stiller and Yadav, 1978).

By the 1980s, the civil service in Nepal had grown into 19 ministries, 42 executive departments, numerous public utilities and 12 constitutional bodies, among them the 'Commission for the Prevention of Abuse of Authority' to investigate corruption (Shrestha, 2001). There was an annual growth of civil servants of 5.000 per year and the civil service grew to 90.000 employees, making it the biggest employer organization in Nepal (Shrestha, 2001). Out of this number, there were about 2.000 engineers of which 575 engineers were assigned to the Ministry of Water Resources (WECS, 1984). These numbers make the civil service in Nepal relatively small in size in comparison with other countries in South Asia (and four times smaller compared with the civil service in the Netherlands) (see Annex 8). By this time, the civil service in Nepal was already known as one of the poorest paid public administrations on the globe. The salaries were low by Indian public service standards and these were considered by the WB to be among the lowest in the world (WECS, 1984: 12).

In the last two decades, the size of the civil service has stabilized. As per November 2010, the Department of Civil Personnel Records reported 75.808 officers for the civil service. Out of this number, Poudyal (2009) reports a total of 11.304 higher level officers (gazetted class officers), about 15% of the total civil service. The new buzzwords in the neo-liberal aid regime (since the 1980s) are decentralization and reduced government spending. This is reflected in the Decentralization Act of 1982 and the Local Decentralization Act of 1999. Meanwhile, the transition to democracy in 1990, the return and fall of royal power between 2002 and 2005, and the Maoist insurgency between 1996 and 2006, has increasingly exposed the civil service to party politics, favouritism and corruption (Poudyal, 2009). All this has added to a culture of lethargy, low productivity and absenteeism that continues to characterize the public administration in Nepal today. Promotion opportunities are few, the administrative culture discourages creativity and initiative, morale is low and most civil servants adopt a 'survival attitude' of holding two or more jobs in order to bear the living cost (WECS, 1984: 8). There is a strong centralization of authority – it takes about 4 months on average for relatively small district level budgets to be released at the central level – and the civil service in Nepal functions essentially as a self-serving organisation, working often against or contrary to public interest (Bista, 1991; Shrestha, 2001; Dangal, 2005; Poudyal, 2009).

When studying the masculinity of (irrigation) engineering in the civil service – the roadways of engineers and overseers – it is important to take into consideration the (cultural) characteristics of the public administration. First, like the national education system in Nepal, the civil service operates as a closed system of the COP of the National Elite. Occupation within the civil service has been a traditional avenue of employment for male members of the B/C castes and Newar people, who, with the right afno manchhe connections, can expect speedy placement, regardless of actual needs of the bureaucracy (Bista, 1991: 154). This situation has produced a relatively coherent and homogenous, and distinctly masculine civil service in Nepal (see Figure 2.6 and 2.7). Figure 2.6 presents an age and gender pyramid of the civil service. It shows that only 15% of the staff has the female gender. In 2000, this was 8%, suggesting that public service has become more accessible for (high-class, upper-caste) women in the last decade (UN, 2008). However, few of these women have ended up in higher positions – around 4% in 2000 and 5% in 2013. In addition, there exists considerable variation in the service categories of the service. For instance, the engineering service which provides most personnel to the DOI, had only 3% female employees in 2010 – in total 246 women engineers (see Annex 9 for these numbers). Figure 2.7 presents the caste and ethnic background of civil servants for the gazetted class positions. It shows that 86% of the positions are occupied by B/C castes and Newar people.

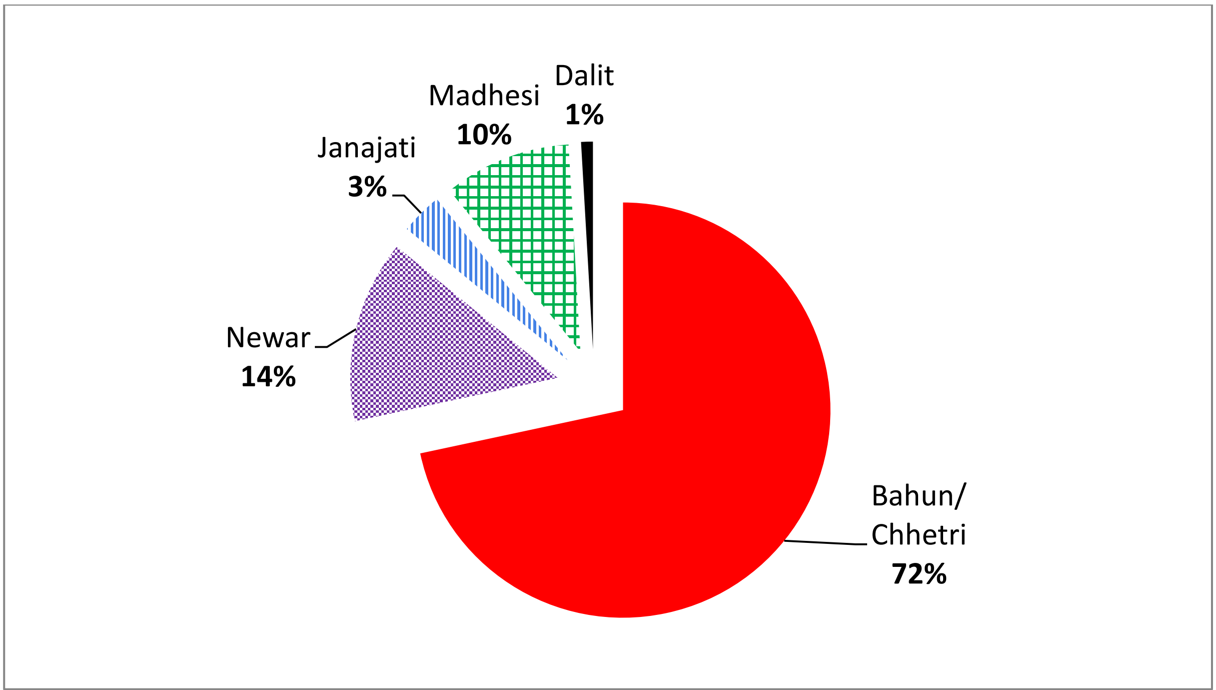
Figure 2.6: Age and gender in the civil service in Nepal



Source: Department of Civil Personnel Records, May 2013. See Annex 9.

Figure 2.6 also illustrates that the civil service in Nepal is a relatively 'old' organisation. The average age of officers is 43 years, with the majority of the officers being between 46 and 55 years. At such an age, officers have often completed over 20 years of service (the retirement age is 58 years) (Dangal, 2005). The seniority of the civil service is a distinct masculine characteristic of the public administration. These men (still) tend to associate government service with *rajako sindur* ('the grace and favour of the king'). It gives them high status in society and makes them behave as 'public masters' rather than public servants (Dangal, 2005: 67). In this context, acting senior and showing respect for (male) seniors is an important social norm in the civil service. For instance, senior officers mark their status and seniority by big name plates at the office door, laying claim to a car and personal driver, having a waiting room and newspapers available for visitors, and putting a messenger attentively outside the office for orders (Dangal, 2005). Seniority is the overriding concern for promotion – not performance evaluations based on merit or actual work completed.

Figure 2.7: Caste/ethnicity of the civil service at gazetted class levels

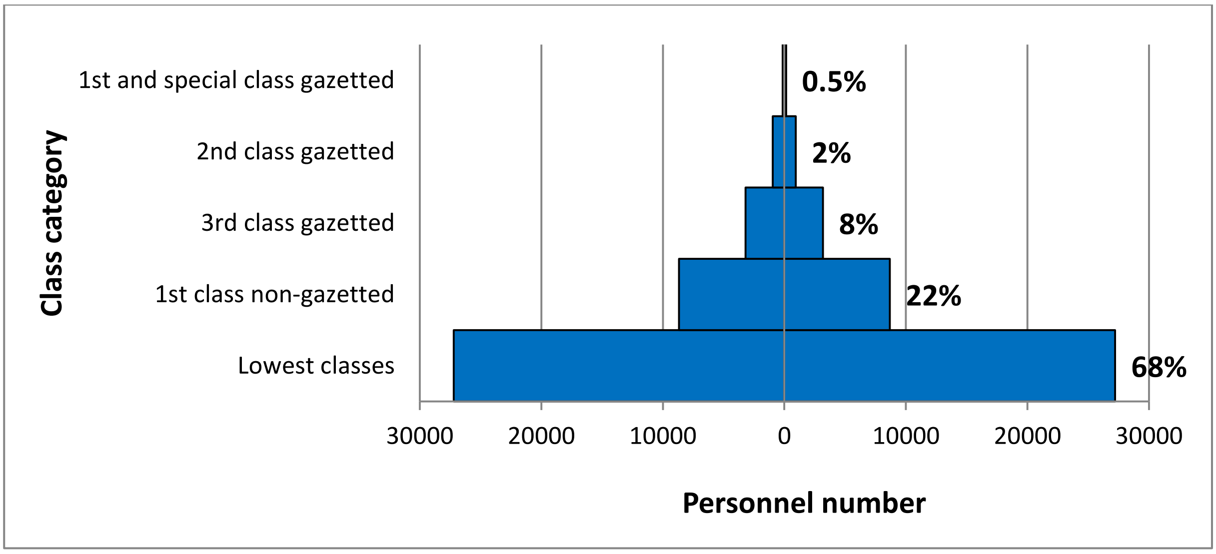


Source: Poudyal, 2009. See Annex 9.

The formal incentive structure of the civil service for recruitment, promotion, transfers and postings, is a deeply contentious issue in the civil service. It is based on a complex system of rules, examinations, interviews and performance evaluations (see Shrestha, 2001; Dangal, 2005; Udas and Zwarteveen, 2010 for a background). The strong hierarchy and competition in the civil service, and the informal practices that go with it (chakari, afno manchhe, source force, tipani), make the pursuit of a career in the civil service a deeply gendered practice. This can be illustrated by an analysis of the organisational structure and the education level in the civil service. Figure 2.8 presents the organisational structure of the civil service. It shows that the bureaucracy is built up as a hierarchical pyramid. For each gazetted first-class position, there are about 5 gazetted second-class positions, about 18 gazetted third-class positions, and so on. When comparing the organizational pyramid of the civil service with the age pyramid presented above (see Figure 2.6), it is not difficult to see that many (senior) officers wait in vain for their promotion. Similarly, Figure 2.9 presents the education level of the civil service in Nepal. When comparing the education level pyramid with the organizational structure of the civil service (see Figure 2.8), it shows that many officers are (also) overqualified for their position, stuck in the lower echelons of the civil service and ‘waiting’ to employ their knowledge and skills. The frustration among these men translates in favouritism and strong male networks in which it is difficult for women to operate.

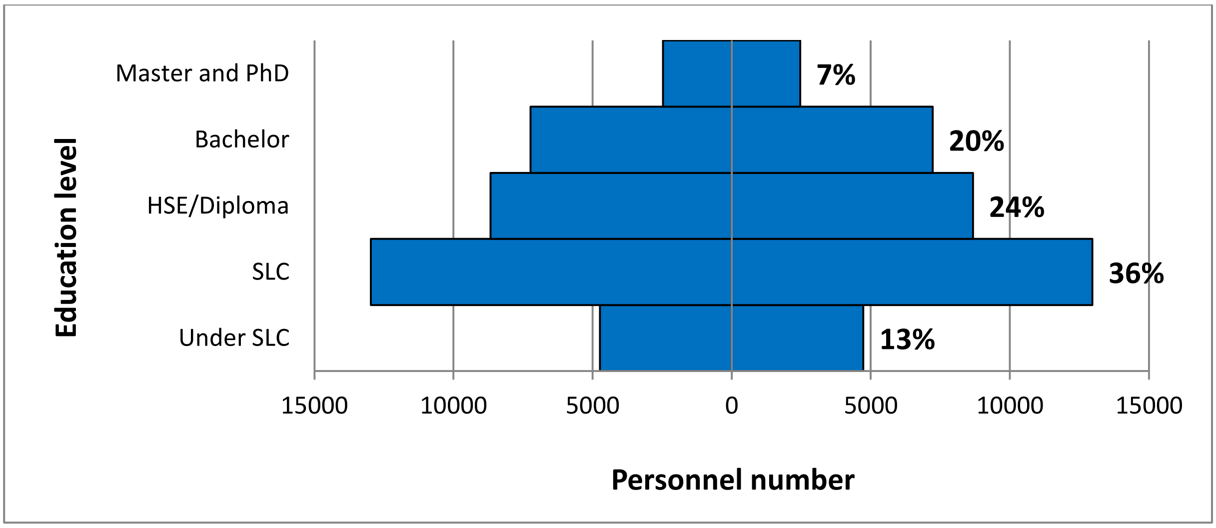
The effect of provisions for quota (for women, Janajati, Madhesi, Dalit, disabled people and people from remote areas) in the second amendment of the Civil Service Act of 2007, to ensure equal representation in the government, still has to be seen.

Figure 2.8: Organizational structure of the civil service based on total staff



Source: Poudyal, 2009. See Annex 8

Figure 2.9: Education level of the total staff of the civil service in Nepal



Source: Department of Civil Personnel Records, website visited on 22-5-2013. **Note:** SLC = School Leaving Certificate, HSE = Higher Secondary Education.

2.4 Why there are so few women irrigation engineers in Nepal

It is important to look for explanations why female engineers in Nepal are almost completely absent in the DOI, because the invisibility of women professionals in irrigation is considered a marker of a masculine working culture in irrigation (Zwarteveen, 2008; 2011). In Nepal, the DOI and the DA in a larger extent, have employed women professionals, but rarely as technicians and engineers (ERA, 1973; HMG-N/Winrock. 1980; Adhikary, 1995; Devkota, 2003; DOI, 2008; SaciWaters, 2011). This is all we know. The performative capacity of this literature portrays and reinforces the perception that the ‘entry’ of women professionals in (irrigation) engineering is something ‘new’ (SaciWaters, 2011). The performative effect is also that it obscures histories of Nepalese women professionals who have been performing their job in rural and agricultural development alongside and indeed majority of male professionals, as home economic scientists and Junior Technical Assistants (JTAs) in agriculture, as rural community development specialists in project implementation, and sometimes also as overseers and engineers in infrastructure development (Shresta, 2007).

To make professional performances of women professionals visible in rural development and natural resources management in Nepal, and to explain their invisibility in more specialist fields like irrigation engineering, I adopt a broad understanding of ‘professionalism’ and ‘rural development’, from field workers to officers, and from extension agents and technicians in health, nutrition and agriculture to engineers and social organisers in irrigation. This is important because the changing position of women professionals in development in Nepal can only be understood in relation to (international) discourses of science and technology, and to (foreign aid) conceptualizations of femininities and masculinities and the proper roles for ‘men’ and ‘women’ in development and in nation-building. The assimilation of modern ideas and new technology in the 1950s in Nepal went accompanied with the introduction and validation of two non-integrated streams of thought – the humanities and social sciences on the one hand, and the more in development applied technical, engineering disciplines on the other like medical sciences, agricultural sciences and infrastructure construction (Ensminger, 1966; see Staples, 1992 for India). This dichotomy of thought has remained strong in South Asia and is marked by ‘horizontal segregation’, common to both South Asia and the West. Concurrently, women professionals are concentrated in the less socially valued areas such as social sciences (Gupta, 2007: 511). This segregation changes with time and across cultures (Nair, 2012), but it (still) informs (or rather restricts) the performances of women professionals in Nepal, acting mainly as social scientists and community development advisors – not as overseers and engineers.

Western donors coming to Nepal in the 1950s and 60s, projected their own views of gender relations and social equity on Nepal, validating the division of men/women as major hegemonic social dichotomy in the process of nation building in the image of Western and especially US models of democracy (cf. Tamang, 2002). Before that time, social relations between classes and ethnic groups, and between men and women of these groups, existed in a caste-based moral order that was enforced by the state (Höfer, 2004 [1979]). This order did not allow for the conceptualization of homogeneous groups of ‘Nepalese men’ and ‘Nepalese women’. With the start of planned development and the introduction of liberal and rational values from the West, Hindu regulations and caste practices in Nepal came to be seen as 'backward' and 'traditional' (Donner, 1966). Western agents conceptualized the Nepalese population as a relatively homogenous, poor and uneducated group of people who would be better off when adopting modern science-based knowledge, attitudes and modern behavioural patterns (Chapagain, 1972). In this liberal view existing partitions along class and caste divisions were either denied or intended to overcome by creating development opportunities. A gender specific differentiation was locked in this view. Men were supposed to learn about agriculture and new technologies, and women were addressed to learn modern insights on nutrition, health care and sanitation. The latter was known as the field of 'home science' or 'home economics'.

The field of home economics was an integral part of national rural development programmes in many western countries, approximately from 1900 onwards. Generally, it can be stated that it was closely related to what was considered important to rural women in their specific circumstances. In most countries there were specific activities for farm women and these efforts were closely connected to agricultural innovation programmes oriented to farm men (see van der Burg, 2002; 2010; 2014 for a background). As a discipline it first got well established in the US at Land Grant Colleges as part of rural development research and outreach (Knowles, 1985). In the US, also programming for Native American and Afro American rural women was started to support these groups of the population in their 'integration' in the national culture and economy (Jensen, 1986; Janiewski, 1988; Walker, 1996). Likewise, in areas colonized by European empires or taken under control by the US, home economics was implemented in rural development planning on a small scale. After the Second World War, home economics was taken up in US and their Land Grant College's aid efforts for agricultural and rural reconstruction in Europe under Marshall Aid (van der Burg 2002; van der Burg and Bos-Boers, 2003). In this context, home economics was also easily connected to FAO, WHO and UNICEF programmes with regard to food, nutrition and health (Hamilton, 1965; van der Burg, 2014). Also in Nepal, home economics was introduced and it became part of a nationalist and modernist development discourse of bikas (Tamang, 2000; 2002; see also Axinn, 1998; Sachs, 1996).

In reference to irrigation, specific attention is paid in the analysis to the discussion on 'social organisers' in irrigation in the late 1980s and early 1990s (Gautam, 1989; 1990; Bajracharya, 1990; DOI/ILO, 1992; Sharma, 1992). This discussion was held amidst policy debates on women's – and users' participation in irrigation, public interventions in FMIS systems and the role of WUAs in state controlled irrigation systems. Saliently, this debate did not result in an increased involvement of women professionals in irrigation in spite of new employment opportunities for community specialists and social scientists in the irrigation sector.

2.4.1 The invention of "Nepalese women" as household managers (1950s)

Government-initiated national rural development in Nepal started in 1952 with the 'Village Development Programme' (VDP), the flagship programme of the USOM (Mihaly, 1965; Skerry *et al.*, 1992; Fujikura, 1996). The activities of USOM were modelled after the 'Community Development Programme' in India that was funded by the Ford Foundation (Staples, 1992). These programmes aimed to 'bring new ideas into villages' and focussed on rural extension and the direct transfer of knowledge (Donner, 1966: 7). The first director and chief agriculturalist of USOM in Nepal, and the first country representative of the Ford Foundation in India, had all worked in agricultural extension in the US (Skerry *et al*., 1992; Staples, 1992). In the view of the Americans, scientific knowledge and technology were perceived as a catalyst for national development and a stable democracy. The main objective of the VDP was to raise agricultural productivity and improve economic conditions through the introduction of 'scientific agriculture'. The programme was to act as a two-way channel between the government and the people – state agents carrying information into the villages and bringing back the problems of the people to the government. For this purpose training centres in Nepal were opened to teach medium-level technicians and village development workers (VDW) who were to engage with villagers (Chapagain, 1972).

The VDP was intended to have a nationwide impact and envisioned nothing less than bringing about *radical changes* in existing patterns of farming. This could only be achieved, it was believed, by inducing attitudinal and behavioural changes through the process of teaching and extension service (Chapagain, 1972). The radical changes were meant to cover every single aspect of rural life, *both in and outside the household*. It was anticipated that villagers would turn subsistence farm households into 'farm enterprises' (Rauch, 1954), abandon 'backward' agricultural practices, and adopt new technologies like irrigation, fertilizers, pesticides and high-yielding crop varieties (Theuvenet, 1953). It was expected that villagers would change food habits and adopt a more nutritious diet (Donner, 1966). They also were introduced to poultry and pig farming, fisheries, modern food storage methods, cooperative credit schemes and new forest land management methods (Sakiyama, 1971; MFAI, 1975). To make this work, it was important that the *entire village community* was to be associated actively, and that strong women and youth movements in the villages would emerge alongside of farmers' organisations (Staples, 1992). Following the practice in rural extension in the US, so called '4-H-clubs' were established in villages to reach the youth and teach them about new technology (FAO, 1969).[6] In this model, rural women were primarily targeted as caretakers for drinking water, sanitation, health and nutrition (see Staples, 1992 for India) – a field of

[6] 4-H-clubs were developed by US researchers at experiment stations of Land Grant Colleges in the 1920s and 30s. The 4 H's stand for head, heart, hands and health. These clubs had a learning-by-doing approach, and focused on youth, both boys and girls in separate groups, in recognition that youth are more open to new ideas than adult farmers.

expertise considered suitable for women professionals and taught by women professionals in home science or home economics (cf. van der Burg, 2002).

In 1954, the Ford Foundation made its entry into Nepal by starting a women's school in Kathmandu to train 'women village development workers' (*gram sevika*) in collaboration with USOM. These village workers can be considered the first women professionals in rural development in Nepal. Classes began in 1956 and USOM recruited an American female home economics advisor to work with the programme from 1956 to 1960 (Ensminger, 1966; Sakiyama, 1971; Skerry *et al*., 1992). In addition, five Nepalese women were trained outside Nepal. The training at the school was designed for one year and the subject matter included food, clothing, home management, handicraft, child care, gardening and poultry (Donner, 1966). In 1956, the Ford Foundation also assisted with the establishment of the 'Nepal Women's Organization' which was to function as the overarching association to mobilize and organize women in Nepal. Female home scientists and female VDWs were supposed to take a leading role in the formation of women groups at the village level (Donner, 1966), just as was practiced in the western countries through the organisation of grassroots 'Women Institutes', 'Farm Women's Circles' or other rural women's groups (van der Burg, 2010). Parallel to these activities, starting in 1956, there were offered elective courses on home science at the 'College of Education' in Kathmandu, a training facility for future secondary school teachers (Donner, 1966). The progress of the VDP and the development of home science activities, however, went much slower than anticipated. By the end of 1958, less than 6% of Nepal's 28.750 villages were covered by the VDP, and only 613 of the planned 4.000 VDWs had been trained (15%). At that time, just 29 female VDWs had been trained (about 5% of the total VDWs), and only 30 girls per year had enrolled the training programme (USOM, 1958; Chapagain, 1972). By the mid-1960s, the situation had barely changed. In 1964, there were only 10 female home economic specialists with a bachelor degree in Nepal. By 1966, it was reported that 230 girls had completed training on home science, and about 50 girls had followed elective courses in home science (Donner, 1966; Skerry *et al*., 1992). A professional career as field worker or home scientist in the 1950s and 60s was thus available for a very select group of Nepalese women only.

In the capacity of home scientists and VDWs, women professionals were assigned a supportive and subservient role in national rural development. In the 1950s, Nepal was diagnosed as an 'archaic society and economy', and to achieve social welfare and economic progress, it was envisioned that 'a considerable amount of people and capital would have to be diverted from agricultural to non-agricultural sectors' (FAO, 1969: 7-8). This was mainly considered a men's affair. By making agriculture more efficient and productive through technology transfer, it was expected that a large part of the rural population could be turned into an industrial labour force. In this process, rural women were to contribute and act as 'managers of the family', running the household efficiently with the available resources, and supporting the male members of the household in their more productive roles in agriculture and industry (Sharma, 1966: 128). In this view, innovation in the household domain became the domain of development for women, and the application of technology to facilitate changes in the labour force became the domain of development for men. In this context, the teaching of women on new technologies (for the household), and the training of women as VDWs and home scientists embodied a small and clearly marked space for a legitimate performance of female professionalism. Young women from the villages were expected to act as VDWs and home scientists, and '*young men* from the villages who were willing to work with their hands, able to read, write and do simple arithmetic [calculations] and *willing to work where-ever assigned in Nepal*, were selected [for medium-level and agricultural specialists jobs] and given four months training' (emphasis added) (Chapagain, 1972: 7).

The invention of 'Nepalese women' as American-style household managers produced contradictions between the content of Western home science education and the reality of Nepal, which verged on the ludicrous. The countryside of Nepal was practically unknown to foreigners as well as to many of the Kathmandu-based national elite, and neither of them was acquainted with agricultural practices in Nepal's diverse regions (FAO, 1969). To bridge this gap village women were encouraged to be trained and included as was common use in western development programming. The idea of female VDWs was that 'girls from village[s] are educated, trained and [go] back to do development work' (Donner, 1966: 3). In practice the new education opportunities for women were captured by the elite in Kathmandu – by high-class, upper-caste women who had no farm background and no aspirations for hands-on rural extension work in the Terai (Chapagain, 1972). Most trained female VDWs got married, left the service or decided not to do this work anymore for other reasons, and it was nearly impossible to get candidates to serve in remote places (Donner, 1966). In the end, upper-caste women, mainly from the Kathmandu Valley and some from the Eastern Terai, fully dressed in colourful saris, were taught how to bind straw in the field for model household use in the Terai (see Figure 2.10). This was a strange performance of modernity. The picture reveals that the 'workers' stand around puzzled, are not acquainted with agricultural skills and are surrounded by rural menfolk who look at them with interest. Upper-caste women from Kathmandu at work in the field was a novelty, particularly because they did an activity that was not useful in the agricultural system of the Terai, as straw was usually burned on the fields to save labour and keep fields free of rodents. Saliently, this practice of burning was perceived by Western agricultural experts as a waste of resources from the perspective of land productivity (Rauch, 1954). The effect of higher class women willing and being allowed to perform professionally in public was occasionally discussed in western contexts, but would only later be addressed more explicitly by feminist scholars in historical reconstruction and analysis after the 1980s (see Ambrose and Ketchnie, 1999; van der Burg, 2002).

Figure 2.10: Women village development workers at work in the field in the 1950s

Source: USOM, 1958

The expansion of the modern state in Nepal, made possible by foreign aid, went thus accompanied with very few employment opportunities for women professionals. Western-introduced modernization basically endorsed only those career opportunities for women which had a direct connection with the perceived role and position of rural women in Nepal, as teachers, health workers and home scientists. The following excerpt of a conference paper of Miss S. Sharma, a Nepalese 'assistant home scientist' at the second agricultural conference in Nepal in 1964, aptly summarizes the position of women professionals at that time: 'Some foreigners visiting our country have observed that the wastages in one country [Nepal] are much greater than in other countries [the West]. Much wastages occurs in the food cooked and served, throwing off of the nutrients from foods through practices such as peeling of vegetables, discarding cooking water from rice, over cooking of vegetables, deep fat frying and use of highly milled rice or wheat (...). Added to this are the wastages through deterioration of food by natural causes which can be avoided in every home by using modern methods of food preservation and storage. Such wastage is a crime in a poor country like ours. No amount of government will help to save this, until the women are trained to be aware of this wastage and learn scientific methods to avoid them. Home Science education gives this much needed knowledge, and thus it contributes immensely towards increasing and conserving national wealth' (Sharma, 1966: 129). The detailed descriptions of activities that were considered wrong showcase how narrowly the role of women professionals was defined in rural development at that time – as experts of women affairs and practices inside the home.

Home science activities in Nepal in the 1950s and early 1960s were small in scope by all means, but instrumental in setting the terms for legitimate performances of femininity and women professionalism in modern Nepal. It placed future women professionals in a gender restricted subordinate position in the national development project of bikas, validating horizontal segregation in development practice in Nepal. The few women who managed to become professionals at that time 'surfaced' in less prestigious areas such as home science, and the few who were sent to the US as education professionals mainly ended up dealing with social issues such as girls' education, health and nutrition (USOM, 1958; ERA, 1973).

2.4.2 Creating wise mothers and competent wives (1960s and 1970s)

This trend continued in the 1960s and 70s. Women professionals emerged in nursing, education and social science, but hardly in engineering and technical disciplines (ERA, 1973; HMG-N/Winrock, 1980). An important factor that contributed to the marginalization of women professionals was the imposition of direct royal rule and the installation of the Panchayat democracy in 1961 by king Mahendra. This move was legitimized by the claim that the political parties were ruining the nation. More specifically, '[k]ey to the legitimization of indigenous [panchayat] control over the state apparatus in Nepal was the doctrine of 'development' – *bikas* – as '*the* national project' (original emphasis) (Tamang, 2002: 314).

These events coincided with the emergence of the global discourse of development with its production of the ‘underdeveloped Third World’ (Evesta, 1992 cited in Tamang, 2002: 314). In this discourse, the people of Nepal were portrayed as victims who were struggling to become modern. Foreign donors, while officially denouncing the events, were sympathetic to the royal take over, and aid continued undiminished (Mihaly, 1965).

The Panchayat democracy was fortified by the king’s claim of supreme authority according to what was stated to be the sacred Hindu traditions and customs of the kingdom (Tamang, 2002). In this context, the home and the family became a key institution in the project of nation building, and ‘women’s development’ turned into a central concern of the state. The Panchayat system foresaw in a special class organization for women, the ‘Nepal Women’s Organization’ (NWO) – originally initiated by the Ford Foundation in 1956 – alongside official bodies for farmers, youth, business and ex-army (Caplan, 1975). These class organizations were non-political interest groups that functioned parallel to a four-tier system of panchayats or councils from village to national level. National integration was the objective, and the creation of a single national culture based on Hindu norms was part and parcel of bikas (Tamang, 2002). In the discourse of ‘national reconstruction’ based on Hindu norms and according to the western model, the position of women in Nepal was affirmed as mothers and wives.

The new desired modernist-nationalist performance for the ‘educated’ Nepalese woman is illustrated by a newspaper article in the ‘Rising Nepal’ in 1966, reporting about Mrs. Kamal Rana as being the initiator of the ‘Women Volunteer Service’ in 1953 and the first representative of the Nepal Women’s Organization under the new government (Esnaarjay, 1966). It stated that she has worked tirelessly for ‘the noble cause of the upliftment of the Nepalese women’, educating women on various government reforms. To emphasize her modernity and ‘proper’ femininity, it is mentioned that she has travelled far and wide to represent ‘Nepalese women’ at international conferences in Colombo, Moscow, Peking, New York, Teheran and Geneva. In addition to being interested in ‘social and relief work’, it is reported that she plays table tennis, reads books on constitutional history and public administration, likes knitting, and talks in ‘the most candid manner’ with ‘her characteristic smile’. Asked about measures to increase the economic standing of Nepalese women, she is reported to have replied that ‘a small industry for glass bangles would be of some use’. Hence, Mrs. Rana displayed the new Nepalese woman – educated, modern, married, upper-caste (concerned about bangles), modest, docile and feminine as she was ideally envisioned.

The Western ideal of women as efficient household managers, and the nationalist view of women as mothers and wives provided for a fortuitous match. The conference paper of the earlier mentioned home scientist Miss S. Sharma started by stating that the ‘[h]ome is an integral part of society', that '[h]ealthy, happy home[s] are the nucleus of a healthy, happy nation' and that '[i]t is important therefore, that our women are helped to acquire the knowledge and skills essential to be *wise mothers and competent wives* and responsible members of their community' (emphasis added) (Sharma, 1966: 128).

In the paternalistic discourse of bikas (Thapa, 2005), the space for women to perform as professionals was narrowed down even further, particularly because the discourse of bikas was characterized by struggles over status and resources among international and national policy elites of men. The VDP of USOM was initiated in 1952 under the DA, but soon it was decided that this prestigious foreign project was to have its own department under the 'Ministry of Planning and Development'. This move took place amidst purges in the top ranks of the civil service, and the VDP became deeply involved in turf wars with other bureaucracies (Skerry *et al*., 1992). Eventually, in 1959, the VDP was shifted back to the DA.

In the DA, the VDWs were transformed into JTAs after some more training, including some female VDWs. These female JTAs can be considered the first female technicians in Nepal, specialized in home science. These women had an opportunity to pursue a career in the newly established 'Agricultural Extension Section' of the DA (Chapagain, 1972). The extension division of the DA proceeded working on home science in the 1960s, with the aim 'to give a picture of an advanced domestic life' to the rural population (Donner, 1966: 1). For this purpose, the training and employment of female JTAs continued during the second plan (1962-1965). By the mid-1960s, there were a total of 35 female JTAs in the DA. Home science activities concentrated on the Kathmandu Valley and the Eastern Terai (Donner, 1966). One of the most important activities was the establishment of 'Women's Clubs' at the village level, and explain the rural population about new ideas on nutrition, cookery and food preservation, clothing and home management, handicraft, child care and health.

Meanwhile, the 'Village Development Department', stripped of its content, was transformed into the 'Panchayat Development Department' with the start of the new regime (Donner, 1966). This department grew grown into the 'Ministry of Home and Panchayat' (Chapagain, 1972), the central agency of the Panchayat government that looked after the build-up of the new political system, monitoring the ban on political parties and quelling dissident voices. It also became the central agency that looked after 'women's development', particularly in terms of its social and political dimensions. In 1966, the 'home science service' of the DA came under this ministry (Chapagain, 1972: 48), and the ministry started to fund and train the NWO directly (Donner, 1966; FAO, 1974). The NWO quickly established offices in every district – 57 of the 75 districts were covered in 1966 – and each office was staffed by two trained women. They received a salary from the ministry and were expected to serve as secretary and treasurer of the district NWO, and do group formation among rural women

(Donner, 1966). The focus of the NWO was national integration and the development of the Panchayat system (Tamang, 2002) – not home science per se – and the training of women was shortened from one year to six months to beef up staff numbers. Secondary school education was no longer expected for training, meaning that some of the village workers on which social mobilization for home science education relied, could hardly read and write (Donner, 1966). In the Panchayat era, political participation was defined for rural women as getting organized to change their 'social situation' (get developed, become modern), an approach that embodied a deeply a-political and de-contextualized view on women's development. In short, women's development was 'professionalized' in narrow terms, as a profession of handicraft, sewing, nutrition, child care, home management, family planning and community development.

Development and nation-building under the Panchayat system, and the associated professionalization of development, legitimized very few performances for women professionals in rural development. Career opportunities for women in this period were basically restricted to domains that were commonly seen as 'women's affairs' for which western modern ideas served as reference. Illustratively, a FAO (1974) report advised on a national 'women's programme in Nepal' to be implemented 'separate but integrated into the overall rural development plan'. It stated that 'the IAAS [Institute of Agriculture and Animal Science] should open its doors to women as well as men', and argued that '[t]he curriculum for the certificate in agriculture should have a home science bias, with specialized courses such as child care and feeding, foods and human nutrition, home/farm management and handicrafts' (p.11-12). This quote reflects the common practice in western countries at that time and it shows the continuity in what Moser (1989) labelled as a 'Women in Development' (WID) approach up to the 1980s.

Tied down to women's affairs, the position of female JTAs and home scientists was not to be envied. Women's development was deeply contentious in the Panchayat system. More than in any other profession, home scientists, with the focus on the household and rural women, faced an immense variety of food habits and cultural practices, and had to reconcile a host of ethnically distinct forms of intra-household organisation. This was so obvious that it could not be ignored. Illustratively, unlike mainstream development literature at that time, home science writings mention the existence of 'areas and ethnic groups' and 'food taboos' in Nepal, stating that '[o]ne should never forget that religious taboos and customs regulate the food habits of the average Nepali in a very strong way' (FAO, 1969: 8 and 13). However, acknowledging and building upon Nepal's diverse customs and food habits went against national integration, and was considered a sin. It was seen as anti-modernist and anti-nationalist, and the prevailing diversity in customs and food habits was interpreted as 'the majority [of the rural population] still [being] unresponsive to the new wave of change' (Chapagain, 1972: 13). At the same time, the Panchayat elite, aware of these tensions, made crystal clear to foreign donors that 'the Government (...) was interested only in securing an increased output of the traditional food-stuffs', and female JTAs and home scientist had little choice than to work within the framework of a 'national nutrition policy' based on the proposition that 'the common man in Nepal (...) certainly lacks a balanced diet' (FAO, 1969: 5 and 13).

In these circumstances, it is no surprise that attrition among middle-level technical personnel in Nepal in the 1970s was very high (ERA, 1973). For JTAs, there was reported an attrition rate of over 41%, here defined as people that never enrolled for public employment after graduation or left government service, usually after 4 or 5 years. Gender disaggregated data are not available, but the attrition rate for female JTAs was presumably even higher. If the attrition rates are an indication, it shows that employment in the health sector, as nurses (attrition rate: 13%), health workers (24%) and mid-wives (26%) were the only legitimate professional performances available for women (ERA, 1973).

2.4.3 Identifying and prioritizing women's needs (1980s and 1990s)

In the 1980s and 90s, under a new global discourse on development, the a-political attitude towards the gender specific professionalization of 'women's affairs' continued undiminished, and the space for female professionals to perform in Nepal remained narrow. In the 1970s, donor agencies, based on Western social science, began to conceptualize 'women' as the poorest and most disadvantaged category of people in the world, and they introduced the WID approach, followed by 'Gender and Development' (GAD) (see for a background: Haney and Knowles, 1988; Whatmore, 1988; Moser, 1989; Carbert, 1995; Razavi and Miller, 1995; Sachs, 1996; Mcilwaine and Datta, 2003; van der Burg, 2010). In 1975, the UN declared the 'International Year of Women' and later the 'Decade for Women' (1976-1985), producing high level policy discussions (see also Zinsser, 2002). In Nepal, this led to the formation of the 'National Committee on International Women's Year' and the inclusion of women as a specific group for the first time in the sixth five year plan (1980-1985) (Tamang, 2002). Women in Nepal became imagined within the category of 'Third World women', sharing productive, reproductive and community roles with women across the globe, irrespective of class, caste and ethnic differences (Moser, 1989). The late WID and early GAD approach essentially re-validated the division of men/women as the most hegemonic social dichotomy across the globe. Men-women relations at the global level were conceptualized one-dimensionally as 'two halves [that] make a whole', gender embodied the 'other spectacle' (synonym with women), and the subordination of women was viewed as men having 'power-over' women – a zero-sum game of 'you have more, I have less' (Bobbink and Boomsma, 1995: vii, 2 and 6).

In Nepal, the WID agenda was captured by the Panchayat elite, taking all the credit in bringing to the national fore the ‘women’s question’, disregarding existing political activities of women before the Panchayat era, and setting the foundation for the construction of the agency-less ‘Nepali women’ who had to be actively developed in the female citizen (Tamang, 2002: 316). In this sense, the WID approach did not help reaching the majority of rural women in Nepal, nor impacted the position and numbers of women professionals or got them out of the margins (see account below). On the other hand, the late WID approach did no longer restrict rural women to the household, recognizing women’s multiple roles in agriculture (FAO, 1974). WID advocated that ‘all family members’ (read: men and women) need to get involved in development, separate but integrated into the overall rural development plan (FAO, 1974). Furthermore, WID and GAD, based on the recognition of women’s multiple roles in agriculture and the household, allowed for a shift in view on the position of women professionals in Nepal, questioning their ‘absence’ in professional disciplines like agriculture, forestry and engineering (WECS/CIDA, 1991; DOI/ILO, 1992; Adhikary, 1995; WECS/BSESC, 1996). The debate, however, on women professionals, developed very gradually only, mainly in the course of the 1990s. Since then the status of women professionals in Nepal has been questioned in its own right, no longer connected and debated in relation to the position of rural women in Nepal.

The aim of the WID approach of the 1980s was to identify ‘women’s needs’ in rural development, particularly in the ‘productive domain’ for national development. So far women’s needs had been considered subordinate to the development requirements of the nation, and were strictly conceptualized within the household, as related to the care of ‘her’ family and complementary to ‘her’ husband. Within the new WID approach, women were portrayed as key agents and catalysts for national development, as producers and not only as dependents (WECS/TAEC, 1998). In the image of WID, the goal of women’s development was to get ‘her’ out of the kitchen (Kafle, 1995), and every project was expected to define women as a target (Chhetri and Lingen, 1998). This practice became known as the ‘WID-washing’ of projects like the term ‘whitewashing’ is used to describe money laundering. Among the first international organisations that started working in Nepal in the WID modus was SNV from the Netherlands. SNV started its first ‘women’s project’ in 1981 (a women’s training centre), formulated a ‘women policy plan’ in 1986, and continued to prioritize women’s development in the 1990s by writing a ‘women’s strategic plan’ for the period 1990-1995 (MOFA, 1998). SNV also attempted to integrate women’s development in the Mechi project (HMG-N/SNV, 1987; GON/SNV, 1992).

To meet WID goals, the Panchayat government, through the ‘Women Development Section’ of the ‘Ministry of Panchayat and Local Development’ – previously the Ministry of Home and Panchayat – formulated a nation-wide project for women’s development under technical and financial support of UNICEF. The programme was initiated in 1982 and became known as the ‘Production Credit for Rural Women’ (PCRW). It was channelled through the district offices of the ministry, and handled by ‘Women Development Officers’ (WDO) and ‘Women Development Assistants’ (MOFA, 1998: 96) – previously known as female VDWs (Donner, 1966). The PCRW programme adopted a group loan scheme to promote community development activities in the field of agriculture, water supply, health, literacy, and infrastructure, and soon it was supported by other donors. The Dutch government through SNV was involved from 1983 to 1992, supplying about 20 Dutch women professionals for the PCRW programme. These paid ‘volunteers’ from the Netherlands had professional or university education in the social sciences or agriculture, were mostly between 25 and 30 years old, had little or no professional experience in developing countries, and were contracted for a period of three years (MOFA, 1998). The Dutch women professionals had no formal authority and worked at the district level alongside WDOs among rural women in the villages. This was one of the reasons why the PCRW programme has been perceived as a success – not necessarily because of its reach (it covered 24 districts by 1986 and expanded slowly to 67 districts in 1992) but because the programme staff consisted of young, motivated and well-educated Nepalese women, who had an opportunity to work with enthusiastic expatriate volunteers (MOFA, 1998). The presence of Western women as counterpart staff, made PCRW a space for elite Nepalese women to perform modernity *as women professionals,* working in the national interest of Nepal.

The position of women professionals in relation to other fields than ‘women’s development’ changed only gradually. In 1985, UNICEF began with the ‘Department of Local Development’ to work on community water supply with user committees (WECS/CIDA, 1991). Drinking water had always been considered a women’s issue, but this time, it was attempted to give rural women a bigger say in the provision of services and project affairs. Village women were organized in groups, consulted about the number and places of taps, and invited to join management committees. The focus also shifted to those sectors that always had been considered the domain of men, both in the field and at the professional level, notably agriculture, forestry and irrigation. Projects in this sector that did not look into women’s issues were considered bad projects and had to be ‘WID-washed.’ In this context, there followed a host of WID studies in Nepal identifying household strategies and ‘changing circumstances’ (USAID, 1986; WECS/CIDA, 1991; MOA, 1994; DOI/NC/HES, 1996; WECS/CMS, 1997; WECS/TAEC, 1998). Most of these studies were done quickly and superficially with a few exceptions, ending up identifying women as key stakeholders and calling for women as a specific target group but providing no analysis or suggestions on how to proceed.

Furthermore, in most WID studies, with the objective to remove inequalities for women (Chhetri and Lingen, 1998), the activities of men were implicitly defined as the norm. Nepalese women had to 'get out of the kitchen' for development, and it was expected that they were ready to get involved in the same activities as men. Similar to the produced contradicting expectations of the 1950s, the late WID approach of the 1980s resulted in some conflicting performances of development as well. For instance, in the Mechi project, rural women with a significant workload in agriculture and the household, were now also expected to learn about pipe cutting and to get involved into the maintenance of water supply systems (see Figure 2.11). The first plan of the Mechi project had stated that 'approximately (...) 1000 women of the project area [would be] involved in rural development planning, training, extension, excursions, via the establishment of women groups in *all projects'* (emphasis added) (HMG-N/SNV, 1987: 18). Normally, the upkeep of water systems was entrusted to male village leaders or technicians from outside the village.

While women's development was gradually disconnected from the household domain and health issues, and was approached more holistically in relation to all domains women were involved in such as agriculture, forestry and irrigation, the position of women professionals in Nepal remained unchanged, seemingly paradoxically. By this time, the education system in Nepal produced a small but steady outflow of female graduates in agriculture, forestry and engineering, but they did not end up as technicians or engineers in these sectors (see Chapter 3). The majority of women professionals working in the field, performed as WDOs, community organizers or social scientists, and mainly as additional staff to core project personnel. This situation was not much different in donor organisations. In the 1980s and 90s, SNV personnel in Nepal was mostly male (up to 85%), and the construction part in projects was controlled by (young) male engineers (Bobbink and Boomsma, 1995). In the Mechi project, in the early years, there was only one Dutch female engineer stationed in the field, and the only other Dutch woman professional in the project was an anthropologist, hired as a 'socio-economist' to look after women's inclusion (Verschoor, 1988). This situation changed only partially after the mid-1990s, when SNV adopted recruitment policies for women. This resulted in 25% of the SNV staff in Nepal being female in 1997, but few among them performed as technicians or engineers (Chhetri and Lingen, 1998). The second phase of the Mechi project (1993-1998) hired Nepalese and Dutch women professionals as 'Women Involvement Officers' (WIO) who went to the villages *alongside* engineers and other project staff, yet, among these staff members were very few women, except for some Nepalese female JTAs of the DA. In this context, the (female) WIOs functioned as a side-kick of the project, focussing on sanitation and vegetable gardening (Bobbink and Boomsma, 1995).

Figure 2.11: Training women village leaders to cut pipes in 1988

Source: Private collection.

High level policy attention for women's development remained in the 1990s, both at international and national levels. In 1991, Nepal ratified the UN 'Convention on the Elimination of All Forms of Discrimination Against Women' (CEDAW) – open for signature since 1979. Nepal also signed in 1995 the UN 'Beijing Declaration and Platform of Action' (BPfA), calling governments to develop national plans of action to improve the situation of women in their country (Chhetri and Lingen, 1998). In response, most ministries in Nepal put in place 'women cells' or appointed a staff member as focal point for gender issues. In 1992, the Ministry of Agriculture set up the 'Women Farmer Development Division' to act as a catalyst in the process of integrating women farmers at all planning, policy and design levels (MOA, 1994). At that time, the 'Women Development Division' under the 'Ministry of Local Development' (previously the Ministry of Panchayat and Local Development) was the biggest government organisation for women's development, running the PCRW programme in 67 districts with 60 WDOs and a total of 300 staff. After the Beijing declaration, the government even set up a separate ministry for women's development, the 'Ministry of Women and Social Welfare' (Chhetri and Lingen, 1998). In a similar fashion, international aid organisations in Nepal, like SNV, were involved in the 'WID donors coordination group' (Chhetri and Lingen, 1998). In addition, a host of national women's NGOs were set up, capitalizing on WID and GAD funding opportunities, and no longer restricted by Panchayat surveillance (Kafle, 1995).

These developments also had their bearing on the irrigation sector. The Irrigation Policy of 1992 formalized users' participation in irrigation system management through WUAs, and also adopted that 20% of the representatives should be women in all the executive bodies of the WUA (WECS/TAEC, 1998). The WECS, under the Ministry of Water Resources, established a 'Gender Analysis Section' in the mid-1990s for which it hired women professionals (WECS/CMS, 1997), and the ADB funded 'Irrigation Management Transfer Project' (1995-2002), the flagship project of the DOI in the mid-1990s, aimed to pay attention to 'women farmers' (DOI/SILT, 2001). For this purpose, the DOI cooperated with the IAAS and IIMI for a study on the process of irrigation management transfer and the election of women leaders in WUAs (Shukla *et al.*, 1998). Saliently, the women/gender focus in development projects produced a lot of work for gender specialists, hence, for women professionals from Nepal or abroad with a social science background, *but it did not create a space to perform for female technicians and engineers in the irrigation sector*. This seemingly paradoxical situation is not just an average case of horizontal segregation in the development sector (Gupta, 2007). It is an example how 'women's development' has been professionalized in Nepal, and how development professionalism itself has become a-politically gendered in the discourse of bikas. These circumstances have produced the view that development as an outcome or process and work domain is totally unrelated to the gender of professionals, technicians and engineers.

2.2.4 Unequal citizens (2000s onwards) and social organisers in irrigation

This seemingly paradoxical situation in regard to the position of women professionals in Nepal – high-level policy attention for women's development going hand in hand with a limited space for women to perform as professionals – persists today. The WID and GAD have been replaced by a new international discourse on 'social inclusion' (DFID/WB, 2006). Men and women in Nepal are now conceptualized as 'unequal citizens', as individuals or group members whose participation in national development is hampered by the institutions of gender, caste and ethnicity. In many ways, this concept seems to be old wine in new bottles. The Hindu caste system and prevailing customs are considered 'backward', and women are positioned as victims alongside 'untouchables', and religious and ethnic minorities (e.g. Dalits, Muslims, *janajati*). They are presented as 'agency-less' people who need to be actively developed into liberal and rational citizens claiming their 'rights' for 'inclusive service delivery' (DFID/WB, 2006). On paper, this approach looks impressive because it allows to question social exclusion and discrimination at all levels in society – also among water professionals at international and national levels in relation to gender and caste biases. In practice, however, the approach for social inclusion, like WID and GAD, effectively takes attention *away* from a political debate on how academia and development professionalism itself functions as a system of social exclusion, discrimination and 'enlightened sexism' (Armato, 2013), among Nepalese professionals, among donor officials and expats, and among male and female professionals of these groups. Illustratively, the entry of women at engineering colleges in the 1980s and 90s in Nepal, and the slow appearance of women engineers in the DOI since the 1990s (see Chapter 3) are developments that stand *isolated* from the international and national discourses on women's development. In fact, the gradual increase of female engineers in Nepal appears not to be the result of advocacy of international aid organisations, nor the effect of gender policies that have been implemented effectively, but an example of horizontal segregation in professionalism that is steadily changing in Nepal. The entry of women in engineering suggests that the discipline no longer has the social and exclusive status for male members in the COP of the National Elite that it had before, and is now also a profession considered suitable for women (compare with India: Nair, 2012).

To illustrate how the discourses on WID, GAD and social inclusion in Nepal have continued to professionalize gender issues in irrigation, diligently taking away the attention from a political debate on engineering and professionalism itself, it is worth recalling how 'women's issues' and 'Association Organizers' (AO) were introduced in the irrigation sector –two events that coincided in the early 1990s (DOI/EAST, 1989; Gautam, 1989; 1990; Bajracharya, 1990; DOI/ILO, 1992; Sharma, 1992). When women's issues surfaced in the irrigation sector under the WID approach, they were considered as the labour contributions of women in irrigated agriculture (transplanting, weeding, harvesting), and as the 'water needs' of women located within the boundaries of the 'rural based subsistence household and farm economy' (WECS/CIDA, 1991: 5). In other words, women were never identified as the key target group for irrigation system development, nor primarily for irrigation water use to increase national agricultural production. A focus on women's issues did thus not require significant changes in the operations of the COP of the Irrigation Organization. Illustratively, at a first 'promotional action' in the irrigation sector in Nepal in 1992 to 'sensitize' international and national staff for women's development, it was concluded that (a) irrigation canals should be built permanently to reduce labour burdens of women farmers, (b) water had to be distributed 'just and fair' in the command area, and (c) canal extensions were necessary to supply more water to households to increase 'food intake' and 'family income' (DOI/ILO, 1992). The hype on women's development was thus handled by engineers as an opportunity to rationalize their claim for more infrastructure development or as it was stated: '[g]ender mainstreaming of irrigation projects can be *equated* with the "rationalization" of [irrigation] projects, meaning that the design of projects and the allocation of services and resources is rationally targeted to the appropriate farmers, men and/or women who can maximize the use of the services and resources provided' (emphasis added) (WECS/TAEC, 1998: i).

In-depth studies in Nepal on irrigation, showing that rural women as well as men have active roles in water distribution and system maintenance did not significantly alter this view (Bruins and Heijmans, 1993; Zwarteveen and Neupane, 1996; Ghimire, 2004; Upadhyay, 2004). Male farmers continue to be treated as key targets in irrigation as landowners, as heads of the household and as community representatives. By de-contextualizing women's needs and defining it as a professional field of WID and later of women's issues in 'gender mainstreaming', engineers could treat 'women's participation' in irrigation as an isolated affair, both in the field and at the professional level. In fact, members in the COP of the Irrigation Organization seized the opportunity to take the credit in promoting women's concerns in irrigation by getting the policies right. At the same time, it rendered irrelevant the inconvenient and critical debates on state policies and top-down technology transfer, and the associated exclusion of (women) water users in project implementation (WECS, 1981; Coward *et al*., 1982; Ghimire, 2004). This dynamic is (also) strikingly evident in the way how AOs, also known as social or group organisers, were introduced in the DOI.

The DOI started hiring AOs to 'develop and strengthen the capability of Water User Organisations (...) to assume greater responsibility and authority for O & M [operation and maintenance] of irrigation system[s]' (Gautam, 1989: 1). The first 15 AOs were contracted under the USAID supported 'Irrigation Management Project' (IMP) in 1987 with the goal to test AOs as catalyst agents for the formation of WUAs in the irrigation sector (Gautam, 1989; 1990). The role of AOs was to focus on the 'social aspects' of irrigation projects, defined as group formation, raising awareness among villagers about new policies, and organizing cash and/or labour contributions of water users. AOs were expected to have some experience with rural development work, have secondary school education or have received training in a social, technical or professional discipline, and have a minimum age of 21 years (Gautam, 1989). The IMP was a high-profile, foreign-funded project, and initially people with a bachelor degree applied for the position of AO. This changed when the AO post was institutionalized in the civil service as a non-gazetted second class position – the position of a trained field worker. Nevertheless, the AO posts can be considered the first real opportunity for women professionals to get involved in the irrigation sector – not as engineers but as social organisers and community specialists. However, this did not happen, all the AOs that were hired were male in spite of all the WID talk (DOI/ILO, 1992; Sharma, 1992).

The issue was discussed though – not as an issue of 'irrigation' or 'users' participation' but as an issue of 'women's development'. At the earlier mentioned promotional action in the irrigation sector, one of the AOs is reported to have said: 'The only reason that we are so far not doing something for the upliftment of women is that *they are not part of our direct target group*' and 'to organize women, identify the needs and develop the work plans which would eventually meet these needs, *is not just something which can be done with your left hand while you are actually supposed to do irrigation with your right hand*' (emphasis added) (DOI/ILO, 1992: 40). In a similar fashion, the report stated that 'all the male AOs were very positive about having a kind of local female colleague *who would take care of dealing with the local women'*, and it was recommended that a 'local female <u>Village Irrigation Facilitator</u> (VIF) should be identified and employed on a salary basis' to get rural women 'organized in <u>Female Farmer Groups</u> (FFG)' (emphasis original) (DOI/ILO, 1992: 41, 48 and 50). The qualities of a female VIF were envisioned as 'activeness, respected by villagers (but not nominated by the village male leaders!), lots of self-confidence and [the] ability to spent a few days out of the village for training and orientation' (DOI/ILO, 1992: 48). These quotes illustrate that women/gender issues were not really associated with irrigation and treated as a secondary, third or even fourth concern for social organisers. Subsequently, the AO position was never imagined as a job for women professionals, at least not in Nepal (Sharma, 1992). The idea of women social mobilizers in irrigation never made it but the job of 'community development advisor' or 'socio-economist' in irrigation projects did, and this was sometimes considered a post for women professionals. It can be said that these posts produced the first 'women water professionals' in Nepal (HMG-N/SNV, 1987; DOI/SILT, 2001).

These events illustrate that the discussion on women and/or social inclusion in irrigation *is marked by the complete absence of talk and reflection on the position of engineers* – the most dominant and powerful group of professionals in the COP of the Irrigation Organization. The politics behind this appear evident. To maintain professional hierarchies, safeguard coherence in the COP of the Irrigation Organization, and deal with criticism on state policies and technology transfer in irrigation, engineers and other members of the COP have successfully nurtured the division between system construction and water management, between irrigation and agriculture, and between engineering aspects and social aspects. Because WID and GAD, and now the social inclusion approach in Nepal, thrive on a de-contextualized understanding of women and minority needs, women's issues were (and are) categorized by engineers – in fact by the whole development community – under social aspects in irrigation, *disconnected* from engineering and project technicalities. In this view, the indifference among engineers regarding women's issues has become rational and legitimate, both in connection to the field and professional practice, because '[e]ngineers are only concerned with the technical aspects and are thus (...) not oriented towards (...) social aspects of irrigation like the involvement of women' (DOI/ILO, 1992: 40).

The denial of political aspects and the professionalized nature of the debate on gender and social inclusion in Nepal, have thus hardly contributed to a positive change in the position of women professionals in irrigation. The first human resources studies in Nepal in the 1960s and 70s did not take note of gender issues (ERA, 1973; HMG-N/Winrock, 1980; WECS, 1984), but once gender disparities in the civil service and irrigation projects surfaced as a question, amidst the WID debate, women professionals, like rural women, were captured in the image of the agency-less Nepalese women (Tamang, 2002). This was particularly true for the technical disciplines in which few female professionals were employed (DHV/APROSC/WB, 1989; DOI/ILO, 1992; WECS/TAEC, 1998). Women professionals in irrigation were (and are) portrayed as being immobilized by Hindu customs, restricted by domestic tasks, incapable to deal with 'outsiders', unable to work at odd hours in the field, and unsuitable for cash collection among irrigators (Gautam, 1989; WECS/CIDA, 1991). The needs of women professionals were framed as mostly educational (DOI/ILO, 1992), as a lack of 'trained female capacity' (WECS/BSESC, 1996: 16), and as the requirement for (extra) protection and security in the field (MOFA, 1998). These portrayals ignore, then and now, that a select group of women professionals, as home scientists, JTAs, WDOs and engineers have always worked *in the field*, and that a small but steady number of female students has graduated at engineering colleges since the 1980s (see the next chapter). Paradoxically, the women's debate has put the few women engineers that were (and are) employed in the technical sector in an awkward position (WECS/CIDA, 1991; DOI, 2008). Their professional performance is now conceived as the product of promotional actions and positive discrimination policies, and no longer related to actual work and the execution of projects. The perception is that the employer-organization needs to bend the rules to develop and support women professionals, resulting in a reported lack of camaraderie and openness among male and female colleagues (Chhetri and Lingen, 1998). Saliently, WID, GAD and social inclusion approaches have also helped to validate the view in the irrigation sector that women engineers, particularly Nepalese women engineers, are alien indeed, and that their presence in the DOI is a 'recent phenomenon' and needs to be understood as something 'new'.

2.5 Conclusions

The mainstream account of irrigation development in Nepal – a cultural performance of document and literature review – reveals that the position of the Irrigation Engineer in irrigation governance has changed through time. Very broadly, from a 'traditional engineer' in the words of Robbins (2007), who has feelings of self-importance and a belief in the ability to lead, based on qualities of technical expertise and rational decision-making, to a professional who has a more integrated view on technology and socio-technical systems. The history supports and brings into existence – as I have interpreted it – a story that the position of the Irrigation Engineer today is one of the 'reflexive engineer' to quote Robbins (2007) once more. The Irrigation Engineer is expected to act, or is acting with an open mind-set, taking into consideration viewpoints of farmers and relying on a good working relationship with project beneficiaries to assure cost-sharing arrangements and satisfactory implementation. That having been said, the identity of the DOI as an engineering organisation has been safeguarded and the present professional identity of the Irrigation Engineer continues to have meaning (mainly) in relation to an experience of national development (bikas) in Nepal. The Irrigation Engineer may thus be reflexive and keen to talk with farmers, but 'his' professional identity is most convincingly enacted through the engineering of (big) water projects.

The irrigation history in Nepal and the transition of the Irrigation Engineer from a traditional to a reflexive engineer, reflects a broader trend in engineering in development and how the irrigation profession has analysed itself (see for irrigation: Diemer and Slabbers, 1992; Scheer, 1996; Khanal, 2003; Vincent and Vuren, 2009; and for engineering in development: Robbins, 2007; Wilson, 2006; 2008). The irrigation history of Nepal also exemplifies an international trend in irrigation that engineers may have reflected (and continue to reflect) on their position in development but not on their gender and the associations between masculinities and professional identities in irrigation, at least not in literature. There has been a great deal of talk on gender in irrigation (Merrey and Baviskar, 1998), but this has mainly concerned grassroots gender issues – not the masculinity of the profession itself.

The analysis of the education system and the civil service in Nepal has shown that the roadways for (higher) education and government employment have been gendered from the beginning alongside intersections of class, caste and ethnicity. Both the (higher) education system and the civil service can be considered to function as closed class and caste institutions of (male) members in the COP of the National Elite, reproducing a form of social exclusion and discrimination or institutional sexism in Nepal (cf. Gupta, 2007 of India). This is particularly true for the civil service which is small in size, with about 75.000 officers and just about 11.000 gazetted class positions. Both institutions, particularly the civil service, can be considered to have strong masculine connotations in Nepal. This is not just to say that boys and men numerically dominate these institutions – there are notable exceptions in the field of (higher) education – it is to say that public education in Nepal historically was meant to invoke students with a sense of nationalism and that occupation in the civil service has been a traditional and privileged avenue of employment for boys and men of B/C castes and Newar people, granting them high social status in the COP of the National Elite. An entrenched culture of male hegemony in irrigation bureaucracies, as Lynch (1993) identified it, can thus not be understood without considering the masculinity of the overall education system and civil service in Nepal.

The analysis of the position of women professionals in development in Nepal in relation to the question why there are so few female engineers in the DOI, has shown that a gendered construction of development professionalism and engineering has occurred in Nepal. This should come as no surprise; this is a recurrent theme in feminist scholarship (Oldenziel, 1999; Frehill, 2004). Reflecting international trends in development from the 1950s onwards, building on home science, a nationalist discourse of women's development and then WID, GAD and social inclusion, the legitimate position of women professionals, for most of these decades, was defined in terms of their 'feminine capacity' to deal with 'women's issues' – as household managers, mothers and wives, multiple roles in agriculture, unequal citizens – marked by non-involvement in broader issues of development. By and large, this was true for women professionals both from Nepal and from the West. In these changing discourses of bikas, it was very difficult for women professionals to earn respect and perform as engineers in irrigation and agriculture. To iterate, this is not to say that there were no female technicians and women engineers in Nepal; it is an explanation for their invisibility.

Chapter 3:

Becoming an Irrigation Engineer: Roadways and institutions

3.1 Introduction

In this chapter, I conceptualize roadways for becoming a member in the COP of the Irrigation Organisation, and as an example of one such a roadway, I focus on the (main) roadway in Nepal for becoming an Irrigation Engineer. The COP of the Irrigation Organisation has been identified as an old and international establishment in irrigation governance, its identity being associated with engineering and government-initiated infrastructure development and its operations defined by the working relations between donor groups and the technical agencies of the state. It has manifested itself as a resilient interpretative community of an international and national policy elite in irrigation, changing and adopting new policies and project approaches since the 1980s and situated in the broader COP of water professionalism in Asia (Ongsakul *et al*., 2012). It can be seen to represent the most coherent, and arguably the 'most' masculine, learning environment for professional performance in irrigation. The most direct roadway for becoming a member in the COP of the Irrigation Organisation for Nepalese boys (and girls), is to pursue (civil) engineering studies, join a professional association and secure employment in the civil service of the DOI, and become an Irrigation Engineer. In contrast, Western professionals who aspire membership in the COP of the Irrigation Organization must pursue studies in engineering or another development related discipline – not engineering per se it seems – obtain employment with a consultancy firm, university, INGO or international funding organization (WB, ADB, UN), and secure a mission to Nepal. The analysis in this chapter focusses on the institutions that constitute the 'Nepalese' roadway for becoming an Irrigation Engineer. It is important, however, to recognize the international dimensions of the COP of the Irrigation Organisation, because it is in the image of the perceived standards of Western engineering and foreign water professionalism that Nepalese engineers co-construct and perform 'their' professional practice and identity.

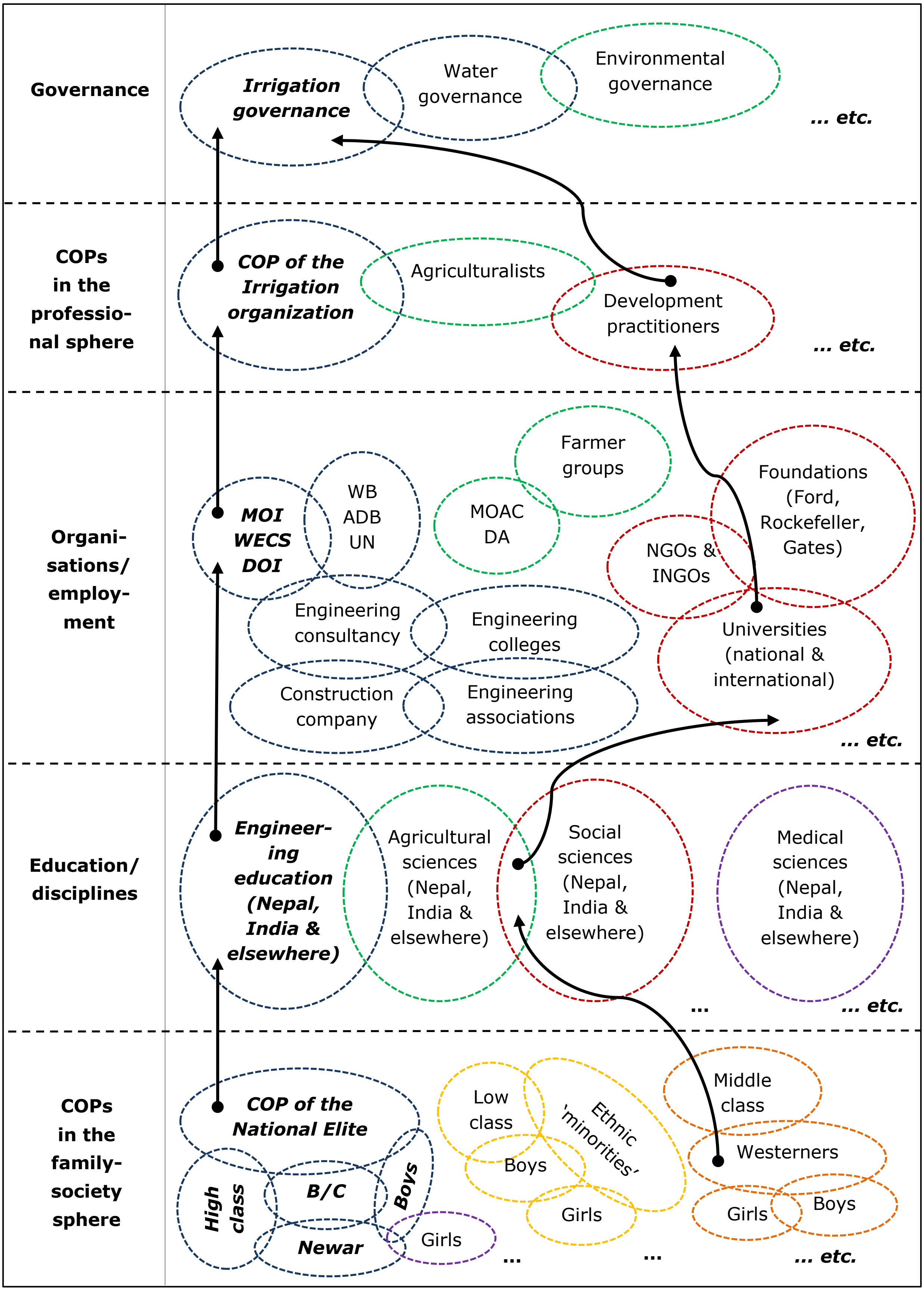
The conceptual angle of 'roadways' – a key term in this and the next two chapters – is to understand how masculinities in irrigation professionalism are sustained through the inclusion and disciplining of young professionals in the COP of the Irrigation Organisation. I am interested in the question of 'becoming' because water professionals like the Irrigation Engineer are not primordial masculine – they acquire masculinities and come to embody it in the act of learning and being taught about professional performance (or they may not). I am also interested in this question because masculinities are likely to be most fully expressed – and visible for research – at the time that juniors enter the profession. If a coherent and gender authentic professional performance in irrigation is to be maintained, and this appears to be the case in the COP of the Irrigation Organization, juniors need to be inspired to acquire legitimate professional identities and 'normal' behavioural practices in the profession. At the same time, it can be expected that the professional culture in irrigation changes with the entry of apprentices in the profession, bringing in new ideas and values, transforming or perhaps even challenging masculinities on the way. In fact, there are strongly held beliefs, both in the West and in Nepal, that male domination in professional fields like irrigation will change over time through the entry of new professionals of the male and female gender, introducing progressive change as a trickledown effect of education, enlightenment and modernization. This remains to be seen, however, and these assumptions deserve scrutiny.

The thinking in terms of roadways is informed by the interest to recognize the connections between the broader family and society sphere on the one hand and the purely professional sphere on the other, and how that links to the politics of institutions and the global system (White, 1997 cited in Zwarteveen, 2008). In the small and growing body of literature on professionalism and masculinities in irrigation, the tendency is to make a distinction between practices that are located 'inside' and 'outside' the boundaries of professionalism. This is almost always followed by a disclaimer that such a distinction is arbitrary because it is precisely social norms and related gender practices that institute the private and public sphere and that govern the boundaries between the family and the professional domain. For instance, in the study 'Situational analysis of women water professionals in South Asia' (SaciWaters, 2011), a distinction is made between wider factors such as 'patriarchy within organizations' in South Asia, and 'the masculine character of the [water] sector itself' (p.8), followed by a disclaimer that in practice 'the two constraints are intertwined and cannot be separated from the other' (p.24). The rare attempt of SaciWaters to question masculinities in irrigation deserves praise, but it is important to focus on the connections and intersections between the family-society and the professional spheres rather than on the distinctions and differences, and understand how those connections co-constitute and define professionalism in irrigation and intersect with masculinities in the COP of the Irrigation Organization.

In the background of this argument, it is critical to note that most literature in irrigation on professionalism and masculinities has focussed on practices that are located *within* the boundaries of professionalism, such as the dominant engineering and bureaucratic cultures in irrigation, and the related epistemic traditions, and irrigation languages and identities (Chambers, 1988; Korten and Siy, 1989; Lynch, 1993; Zwarteveen, 2008; Ongsakul *et al*., 2012). This has been an important step for feminist inquiry in irrigation, because both engineering and bureaucratic cultures have been considered masculine for reasons that also are true for professional cultures in irrigation governance: (a) it is a state culture dominated by men (Tamang, 2000; Connell, 2005 [1995]); (b) male engineers and male bureaucrats fail to recognize women's contributions and concerns in society (Lynch, 1993; Connell, 2005 [1995]); (c) engineering organizations and public bureaucracies are hostile working environments, producing unequal career opportunities for women professionals (Lynch, 1993; Faulkner, 2009a; 2009b); and (d) at the discursive level, there is an embedded and taken for granted association, even conflation, of men with organisational power, authority and expertise (Collinson and Hearn, 1996 cited in Zwarteveen, 2008). This feminist scholarship has levelled the ground to take the analysis one step further, namely to make an argument on masculinities in irrigation based on the intersections that exist between professionalism and masculinities in the COP of the Irrigation Organization, and the ideals and practices of masculinity that prevail in society.

The concept of roadways is presented in Figure 3.1. The top of the figure is the level of governance. It is possible to think of many overlapping 'fields' of governance. The penetrable borders of the exemplary fields of irrigation, water and environmental governance are meant to show that it is loosely defined groups of institutions and actors – not closed entities – which interact for decision and policy making. The second level presents professional COPs that engage in irrigation governance. It shows the COP of the Irrigation Organisation and other professional groups – in interaction. The broadening and integration of irrigation policy perspectives into questions of development and environmental management, has made water professionalism an amorphous COP – a field of expertise that is now also the domain of specialists other than engineers (Molle, 2009; Mollinga, 2009). The third and fourth level from the top show the institutions that give access to a professional COP, respectively for employment and education. At these levels, for instance, it shows the DOI, the Ministry of Irrigation (MOI) and engineering education in Nepal, and also international lending agencies (WB, ADB), INGOs and universities. Also here the borders of the circles are shown as permeable because organisations may cooperate and study programmes may integrate knowledge from various disciplines. The bottom level shows various COPs in society, defined along the intersections of class, caste, ethnicity, gender and also nationality. Here, it shows the COP of the National Elite in Nepal as well as ethnic minorities and (Western) foreigners.

Figure 3.1: Roadways for getting involved in irrigation professionalism in Nepal



Source: Own illustration.

The figure demonstrates, with the open boundaries of the circles and between the various layers, that connections and intersections between COPs in the family-society sphere and COPs in the professional sphere are the rule rather than the exception. It illustrates that all roadways for becoming a professional and for getting involved in irrigation professionalism are diversely gendered along intersections like class, caste, ethnicity, nationality, institutional affiliation and professional discipline. The straight chain of arrows depicted in Figure 3.1 on the left, shows the main roadway for a Nepalese boy (or girl) to become an Irrigation Engineer – the focus in this chapter. Men who belong to the COP of the National Elite enrol for engineering education at a college in Nepal or India. Subsequently, they seek to secure employment in the civil service of Nepal, pursue a career in the DOI and participate as an engineer in the COP of the Irrigation Organisation. On this roadway, boys at least, also acquire the status of a man of standing in the COP of the National Elite and an opportunity to perform up to the norm of Elite Manhood. In contrast, the curved chain of arrows presented in Figure 3.1 on the right, shows my personal roadway for getting involved in development practice and irrigation governance in Nepal and can be considered exemplary for a roadway how a Western man becomes a 'water expert'. As a middle-class Dutch boy, I enrolled in studies in the Netherlands with a focus on irrigation engineering and water management. I secured a PhD position at Wageningen University and engaged myself as a water researcher in the professional COP of development practitioners in Nepal through the Wageningen network. This also allows me to perform as a man of standing in the COP of my class group and in the COP of the academic elite in the Netherlands, giving me an opportunity to perform up to a norm of manhood that is hegemonic in the Dutch sphere of family and society.

When examining the question of inclusion and disciplining of young engineers in the COP of the Irrigation Organization, it is critical to know that the Irrigation Engineer exemplifies a form of hyper-masculinity in the genderscape of masculinities in Nepal. Like elsewhere in South Asia, there exists a popular image of engineering as an 'all-man career' (Nair, 2012: 34), and together with medicine ('becoming a doctor'), it is thought to be the most prestigious profession in Nepal (Adhikary, 1995). The popularity of the Irrigation Engineer is related to the intersection of the image of the (white-collar) engineer and the norm in Nepalese (elite) circles that boys are expected by their family to become a man of standing in society. In other words, becoming an engineer is conceived as a promising roadway for boys to learn about performing Elite Manhood in the COP of the National Elite. This intersection is pointedly illustrated by the fact that thousands of parents in Nepal, like elsewhere in South Asia, have been inspired to have their boys pursue engineering education. This ideal is rooted in the perceived bright career prospects for young (male) engineers and the opportunity to secure permanent employment in the civil service (WECS/BSESC, 1996). Illustratively, in the past, placement for engineering studies in Nepal and India was attached to a 'service obligation' in the government (ERA, 1973). The popular image of the engineer – and the related perceived 'shortage' of engineers in the government – emerged in Nepal in the 1950s and 60s with the start of national development (bikas) (Yadav and Stiller, 1978; see Nair, 2012 for a similar trend in India). Today, the image of the Irrigation Engineer can (still) be seen to embody a cultural ideal of the modern man and powerful father who nurtures and protects 'his' family, and is capable to transform 'his' nation through water resources development. In this thinking, the main reason for girls to pursue engineering education is to create prospects for marriage into a good family (see for India: Parikh and Sukhatme, 2004; Nair, 2012).

The most 'closed' institutions on the roadway for becoming an Irrigation Engineer – and that is the reason to study them – are the education institutions, the regulatory and professional associations, and the DOI. In theory, these institutions are open for any person that is eligible to apply, but in practice they mainly benefit a select group of men in the COP of the National Elite who are able to fulfil the criteria for application (see Chapter 2 for background analysis). These institutions can (also) then be considered to function as the principal breeding grounds for performances of Elite Manhood, and they can be seen to form the connection between the COP of the National Elite and the COP of the Irrigation Organization, whereby the professional performance of the Irrigation Engineer embodies one of the living intersections. As mentioned above, the context of international cooperation in the water sector has always provided Nepalese engineers with ample opportunities to learn about the (Western) hegemonic norms of masculinity in the COP of the Irrigation Organization, and becoming an Irrigation Engineer is generally considered a roadway for men with success guaranteed – no further questions asked by family, friends and colleagues about your (gender) performance.

To understand how irrigation professionalism and masculinities have come to define each other, this chapter presents a feminist reading of the histories of the institutions in Nepal that constitute the roadway for becoming an Irrigation Engineer: (1) engineering and water education, (2) professional regulation and engineering associations, and (3) the DOI. The aim is to analyse how the Irrigation Engineer and performances of Elite Manhood have come to define each other and how access to the institutions has been controlled and regulated in the past six decades by a select group of male members in the COP of the National Elite.

3.2 Institution one: Engineering and water education

To document a feminist reading of the institution of engineering – and water education in Nepal, I have focussed on the engineering disciplines that prevail in the COP of the Irrigation Organization: civil – and agricultural engineering. I also discuss foreign education of Nepalese engineers, because many Nepalese men have gone abroad for engineering studies, particularly in the early years of development in Nepal (1950s and 60s). Background information on the education system of Nepal has been presented in Chapter 2.

3.2.1 A history of engineering and water education in Nepal

Engineering education in Nepal got underway in the late 1950s in the field of civil engineering. Before that time, there were some facilities in Nepal for technical education, but the majority of the Nepalese students went abroad for engineering studies, mostly to India. The first person in Nepal known to have studied civil engineering was Kishwore Narshing Rana, a member of the Rana family who was sent for studies to Japan in 1902 with his personal aids and a cook.[7] Back in Nepal, he helped to construct the first hydropower plant in Nepal at Pharping in the Kathmandu Valley in 1911, and he played a role in the construction of the first modern irrigation scheme in the Terai, the Chandra Canal, in 1923.[8]

By the 1940s, regular but limited scholarships were made available for elite boys to be sent to India for engineering studies, mainly civil, electrical and mechanical engineering, but also agricultural engineering and geology. Places they went were, for example, Roorkee College (civil engineering) and Allahabad Agricultural Institute (agricultural engineering). Most of these institutions in India had been set up by the British with a military colonial objective – Roorkee College (Mital, 1986 cited in Zwarteveen, 2011), or by the Americans with a missionary objective – Allahabad Agricultural Institute.[9] Back in Nepal, they were employed in the emerging state bureaucracy of Kathmandu, for example in the Public Service Department (est. 1934) or the Board of Agriculture (est. 1924). Despite the education of professionals, and some early development-oriented activities, engineering works within Nepal remained almost non-existent and largely unimagined until the 1950s.

In the 1950s, with the new national modernization project of bikas being launched, and with foreign donors entering Nepal, a perceived need for engineers (and engineering education) surfaced immediately as a priority concern (Stiller and Yadav, 1978). In this context, like elsewhere in South Asia, water resources development became quickly conceived in Nepal as a field of civil engineering, as a job of constructing dams, reservoirs and canals (Theuvenet, 1953; UN, 1961; see Chapter 7 for more information). Generally, the Americans and the Commonwealth countries, particularly its Western members, considered the raising of skill levels in the government administrations of South Asia crucial for utilizing the physical resources of the region more efficiently (Davis, 1966; Skerry *et al*., 1992; Oakman, 2000). In

[7] The website of the 'Japanese Universities Alumni Association Nepal' mentions that 8 students were sent to Japan in 1902 (www.juaan.org.np, visited on 1-5-2013).

[8] Kishwor Narshing Rana is mainly known as one of the architects of Singha Durbar (*Lions Palace*), the luxurious government seat of the Ranas, built in 1904.

[9] Roorkee College was established in 1847, later renamed Thomason College, as the first engineering institute in British India. Roorkee College is now known as the Indian Institute of Technology (IIT) Roorkee (see: www.ittr.ac.in, visited May 2013). The Allahabad Agricultural Institute was set up around 1910 by the English-born American economist and agriculturalist Sam Higgonbottom, a missionary who had joined the North India Mission of the Presbytarian Church (see: www.aaidu.org, visited May 2013).

this view, more efficient use of (water) resources through modern technology was considered the lever for growth and social progress, neutralizing, it was believed, a revolution of rising expectations, and preventing communist ideas from emerging in an 'open' Nepal.

Two programmes in particular need mentioning here. In the 1950s, under the Point IV programme of the US, human resources development by training at US universities was part of the work of USOM. Between 1952-1959, in total 164 Nepalese government employees received training in the US, mainly on technical subjects like soil conservation and irrigation techniques (USAID, 1972; Skerry *et al*., 1992). The other initiative took shape in the Commonwealth context, and was the Australian conceived 'Colombo Plan for Cooperative Economic Development in South and Southeast Asia' (Maskey, 1978; Oakman, 2000). The Colombo Plan – the 'Marshall Plan' for Southeast Asia – was motivated by international security priorities of Australia, and was intended to protect Australia from a potentially communist Asian region through technology transfer and social progress (Oakman, 2000). By June 1967, largely with scholarships under the Colombo Plan, 989 Nepalese students had gone to India for education in engineering and agricultural related subjects, and they assumed positions in Nepal's new aid bureaucracies such as the Canal Department (IAM, 1964; Sakiyama, 1971). The Colombo Plan and USOM-assistance did not prevent economic cooperation between Nepal and the then Union of Soviet Socialist Republics (USSR), which included 293 training places between 1952 and 1970 for fields in engineering, agriculture and medicine (Maskey, 1978: 19).

By this time, around 1960, home-grown engineering education in Nepal had slowly got underway. Starting from 1942 – considered the starting year of engineering education in Nepal – there was offered a one-year 'sub-overseer' course in civil engineering at a technical training school in Kathmandu that had been established in 1930 (IOE, 2005). In 1944, this school produced its first overseer-graduates (ERA, 1973). In 1951, the 'Nepal Engineering School' was established and a two-year sub-overseer programme was started in 1954 with input from India. The first batch of sub-overseers graduated in 1961 (Bhattarai, 2009). In 1959, again under technical assistance of India, the course was upgraded to a three-year diploma course in civil engineering, commonly known in South Asia as the 'overseer' course. By January 1964, there was an enrolment of about 60 students per year, and 157 Nepalese overseers had completed their training (IAM, 1964). Around 1970, the school had produced about 400 overseers (ERA, 1973). In 1965, with assistance of West Germany, a second technical school was set up in Kathmandu for courses in (auto) mechanics and electrical engineering. In 1972, with the education reforms (see Chapter 2), the two existing technical schools were brought under the umbrella of Tribhuvan University to constitute the 'Institute of Engineering' (IOE), as it is known today, with two campuses in Kathmandu – 'Pulchowk Campus' and 'Thapathali Campus' (IOE, 2005) (see Figure 3.2 for Pulchowk Campus).

Figure 3.2: Institute of Engineering, Pulchowk Campus, Kathmandu

Source: Website of Institute of Engineering, 2013

Until 1978, the IOE was involved in producing low to middle level engineering personnel in the field of civil, electrical, mechanical and also architectural engineering (IOE, 2005), but donors and the government felt a growing need for engineering personnel at higher levels. Saliently, a 'manpower' study of that time on attrition rates among technician personnel in Nepal, stated as the main problem the lack of low to middle-level technical personnel in the field – not the lack of high-level engineering skills (ERA, 1973). This reveals a politics of higher education in Nepal in which members in the COP of the National Elite were interested in expanding 'their' education and career opportunities, and that of 'their' children (read: sons). In 1978, a bachelor of civil engineering was introduced – the first bachelor degree in engineering in Nepal – with credit from the WB and technical advice from the Japanese Official Development Assistance. The first batch of 'engineers' as graduates with a bachelor degree in engineering are known, graduated in 1983 (WECS, 1984a; DHV/APROSC/WB, 1989). Around that time, about 10% to 30% of the curriculum of the diploma course for overseer and the bachelor degree for engineer focussed on irrigation related subjects, i.e. surveying, hydraulics and engineering hydrology (DHV/APROSC/WB, 1989). Generally, in the 1970s and 80s, the IOE grew considerably in terms of fields of study (engineering subjects), level of study (from diploma to bachelor level courses), and student enrolment. To improve access to engineering education for students outside the Kathmandu Valley, the IOE opened a third campus in Dharan in East Nepal in 1977 with credit of the ADB and technical assistance from the UK, and a fourth campus in Pokhara in West Nepal in the early 1980s with assistance from the WB and the UNDP.

Up to the mid-1980s, higher engineering education in Nepal predominantly meant civil engineering, as bachelor courses in other disciplines were not offered at the IOE. This changed in 1985 when the IOE was mandated, with the help of expatriate consultants, to formulate a ten-year development plan to expand high-level engineering 'manpower' in Nepal (IOE, 2005). This resulted in the launching of the 'Engineering Education Project' (1989-1999) under WB finance together with technical assistance of the Swiss Development Cooperation and the Canadian Development Association (WB, 2000), and in 1994 and 1995, bachelor courses in electrical and mechanical engineering were introduced respectively. This was followed in 1996 and 1997, by the introduction of the first master degree programmes at the IOE, under assistance of the Norwegian government, notably for structural engineering, water resources engineering and environmental engineering – all under the administration of the 'Department of Civil Engineering' of the IOE. Today, at least formally, it is also possible to pursue PhD studies in the field of engineering (IOE, 2005). The engineering education system of the IOE, as it exists in Nepal since the mid-1980s, is depicted in Figure 3.3. It produces basically three roadways for getting involved in the irrigation sector – the low road for technician training, the middle road for overseer (diploma) and the high road for engineer (bachelor). Based on the engineering education system, it is possible to conceptualize an 'irrigation education and training system' in Nepal (see Figure 3.4). However, as can be seen, there are basically no differences in terms of qualifications.

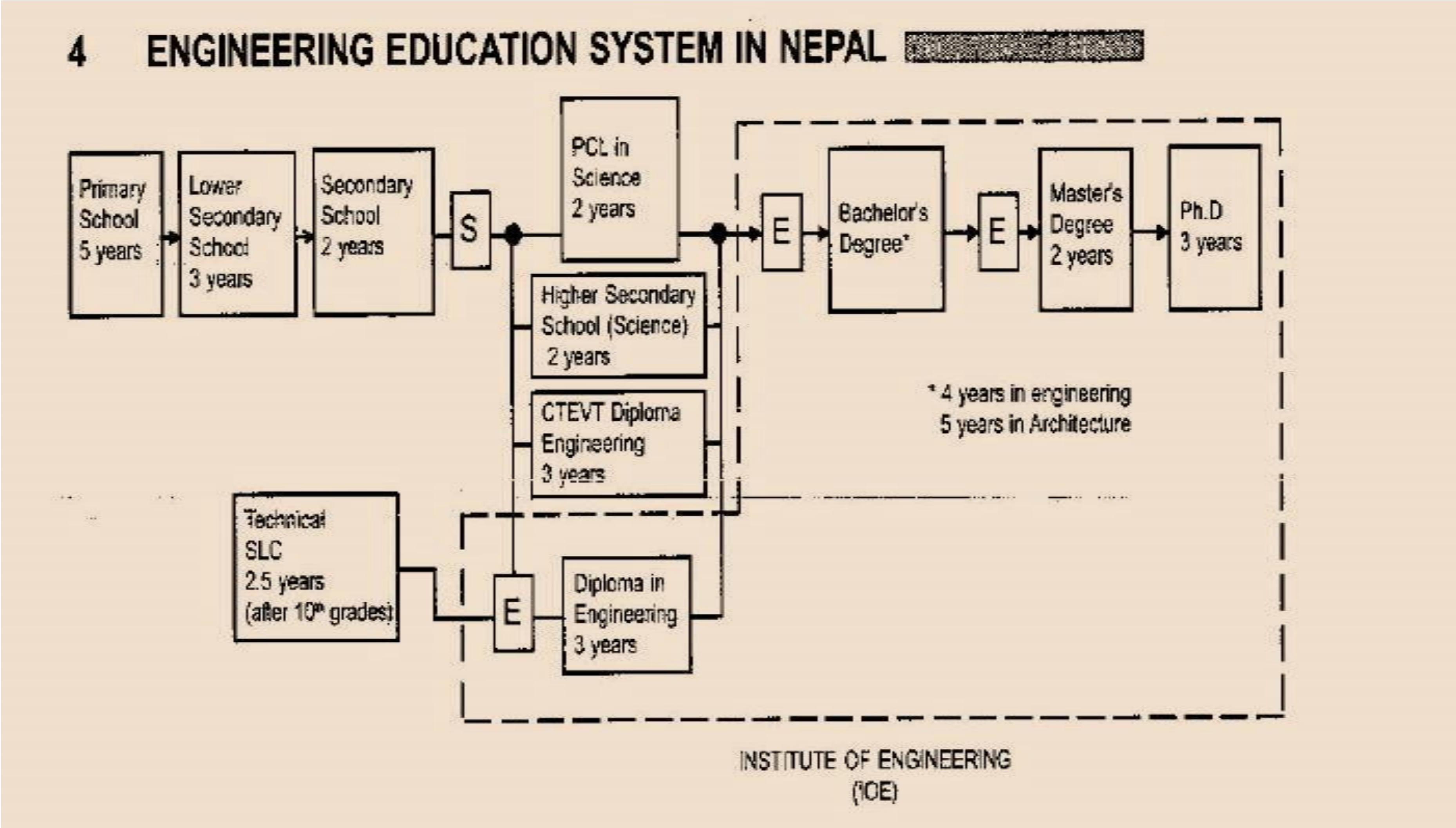
By the early 1990s, the IOE was no longer the sole public institution for engineering and technical education. Technical education and vocational training, from technical SLC, science education at higher secondary schools, up to the level of diploma engineering at schools other than the IOE, came to fall in 1989 under the 'Council for Technical Education and Vocational Training' (CTEVT). This public organization became the regulatory body for all the technical schools and rural training centres that existed or were to be established. The schools monitored by the CTEVT – more than 170 in number – produce now more graduates with a diploma in civil engineering than the IOE.[10] In addition, there has been a growth in higher (engineering) education since the 1990s. Most of the new public universities that were set up in the early 1990s developed curricula for engineering studies. For example, Kathmandu University developed a curriculum in civil engineering in 1994. There also has been a growth of private or affiliated engineering colleges in Nepal, and not just in the Kathmandu Valley (see Annex 10 for an overview). In 1999, the 'Nepal Engineering Council' (NEC) was established to monitor all institutions involved in higher engineering education, including the IOE. In 2011, the NEC had approved education at no less than 33 colleges, and at some of these colleges, as well as on public universities, bachelor and master level education is now offered in disciplines related to water resources engineering and management.

Engineer Deepak Bhattarai, founder of 'Nepal Engineering College' (*NEC*) in 1994 (the first private engineering college in the country), estimated the total student enrolment in 2007 at close to 4.500 students for bachelor level engineering studies (Bhattarai, 2009; see Annex 11). Out of this number, about 38% of the students enrolled for a degree in civil engineering, revealing that the discipline has not lost its popular appeal. Cuts in the national budget for higher education, including for higher engineering education, by two-thirds in the period 1999-2005 (Pahadi, 2008: 43 cited in Bhattarai, 2009; see Annex 12), suggest that a further development of higher engineering education in Nepal continues to rely on donor and private resources. In this context, it is no surprise that admission fees for students at private colleges are high and rising, and that the ADB approved a new project 'Strengthening Engineering Education Technical Assistance' in December 2011 to explore how the 'large unmet demand' for engineering education in Nepal might be remedied.[11]

[10] By 2013, the CTEVT monitored 21 public or constituted schools, about 150 private or affiliated schools, and 8 higher secondary schools. Source: www.ctevt.org.np, visited on 25 April 2013.

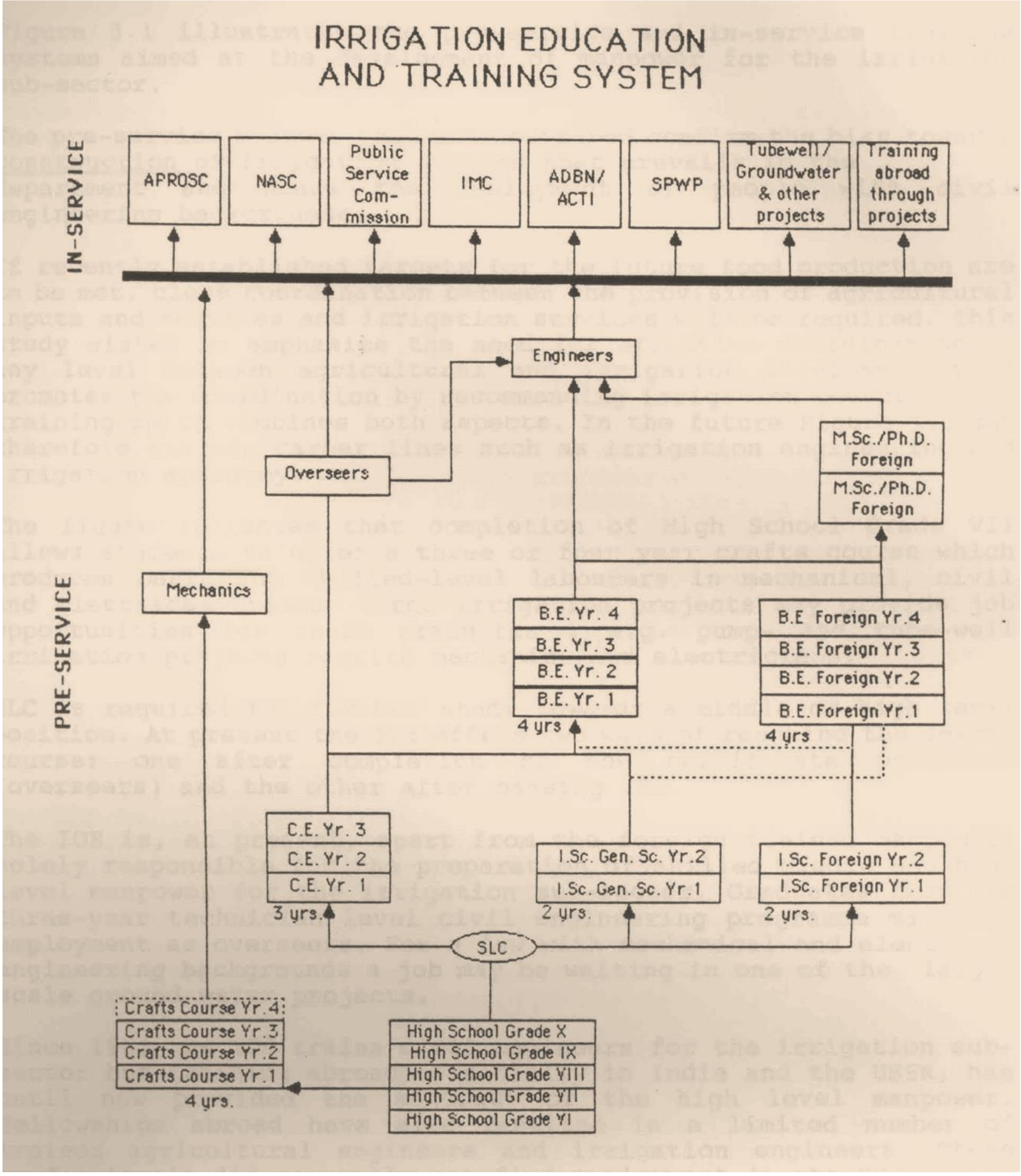
[11] In December 2011, the ADB approved a new grant (USD 550.000) for the project: Strengthening Engineering Education Technical Assistance. See: http://www.adb.org/projects/45192-001/main, visited 25 April 2013.

Figure 3.3: The engineering education system in Nepal (2008)



Source: IOE, 2005. **Notes:** S = School Leaving Certificate; PCL = Proficiency Certificate Level, equivalent to 'higher secondary school'; CTEVT = Council for Technical Education and Vocational Training, supervises diploma engineering; E = Entrance Exams.

Figure 3.4: The irrigation education and training system in Nepal (1989)



Source: DHV/APROSC/WB, 1989: Figure 3.1 (no page number mentioned). **Note:** SLC = School Leaving Certificate; APROSC = Agricultural Project Services Centre; NASC = National Administrative Staff College; IMC = Irrigation Management Centre (DOI), ADBN/ACTI = Agricultural Development Bank Nepal/ Agricultural Credit Training Institute; SPWP = Special Public Works Programme.

Meanwhile, many Nepalese students went (and go) abroad for higher studies, not least because the level of engineering education at the IOE was not always considered up to standard. In the 1980s, the pass rate for diploma level was reported around 9% to 20% per cohort, and just 35% for the cohort of 1987 (DHV/APROSC/WB, 1989).[12] Nepalese students went, for example, for a bachelor degree to so-called 'Regional Engineering Colleges' in India, or for a master degree to the 'Asian Institute of Technology' (AIT) in Bangkok or to Western universities, like Delft and Wageningen in the Netherlands (see Annex 13 for the period 1985-1988). Also worth mentioning are the scholarships provided to 250 Nepalese students to get a bachelor degree civil engineering at the University of Roorkee (1983-1987) for the planned implementation of the 'Karnali Chisapani Multipurpose Project'.[13] Some of these graduates now assume high-level postings in the DOI as an Irrigation Engineer.

Apart from these developments, there also have been some attempts and programmes in Nepal that have aimed to offer specialized, interdisciplinary and integrated curricula for irrigation and water resources management. In the 1970s, the IOE offered students at the diploma level a specialized programme in water supply and irrigation, but this option was abandoned in 1978 when it turned out that the DOI was not interested in these graduates and preferred hiring civil engineers with the highest pass rates (DHV/APROSC/WB, 1989). A second initiative took shape at the earlier mentioned IAAS in Chitwan District in 1985. Here, faculty staff – mainly agricultural professionals – was studying emerging issues in irrigation management in Nepal, and set up the 'Irrigation Management Systems Study Group' (IMSSG) (see Chapter 7 for more information). In 1993, this group organized a workshop on curriculum development in on-farm irrigation management (Shukla, 1993), which resulted in elective courses within the regular agricultural (study) programmes. A more recent initiative, a master degree on interdisciplinary water resources management, was launched at *NEC* under funding of the Dutch government (2005-2011). This programme had an inflow of about 24 students per year (*NEC*, 2008). Most Western programmes on irrigation and water resources management, and also the master programme of *NEC* for instance, include nowadays courses in the curriculum on subjects other than engineering. To illustrate, the *NEC* programme has courses on 'power, authority and history' and also on 'gender, water and social inclusion' (*NEC*, 2008). Overall, however, particularly the bachelor programmes in Nepal, continue to focus on (civil) engineering aspects – and not specifically on irrigation.

3.2.2 Who has access to engineering education?

The history of engineering education in Nepal, as told above, is a story of boys and men. In the beginning, in the 1950s and 60s, when the engineering profession took shape in Nepal, the

[12] The problem was a high absence rate of teachers (low salaries) and that students who had done SLC and had followed science in higher secondary education, had not been taught well (DHV/APROSC/WB, 1989).

[13] These scholarships were provided under a UNDP loan. The Karnali Chisapani Multipurpose Project was never executed because negotiations between Nepal and India on water sharing failed to materialize.

foreign scholarships of India, the West and the communist bloc – mainly Russia – had the dual purpose of raising the skill levels of Nepalese administrators *and* to create an independent national male elite, that was strong enough to manage foreign influence (Tamang, 2002). In addition, it was in the first hour of the nationalist discourse of bikas that engineering education in Nepal was identified as a priority concern among international and national policy elites. Nepal was not unique in this, the modernization dream had clear regional and global dimensions (Nair, 2012), and modern education such as engineering was considered 'the most potential weapon to uproot the traditional conservative attitude of the people' (Maskey, 1978: 14). Both in South Asia, and in the West and in Russia, civil engineering was a masculine professional domain, a world of (modern) men and this shaped the early engineers of Nepal, and the engineering profession in Nepal in general. Critical here has been that the engineering education system in Nepal was 'captured' by Indian from the start, providing Nepal with an imprint of the technical and cultural characteristics of the Indian engineering system – the colleges, the bureaucracy, a focus on construction and the work with contractors (WECS, 1984a; DHV/APROSC/WB, 1989).

In this international but mainly Indian context in Nepal, engineering education was meant for the elite (read: men), and was associated with modernity, construction and the real thing, and with interesting, dynamic and challenging work (WECS, 1984a). These characteristics have strong masculine connotations, and this is much less abstract than it seems. Initially, most engineering colleges in Nepal and India had no girl hostels. At the IOE, for instance, it took until the mid-1990s for a girl hostel to be in place (WECS/BSESC, 1996: 12). Before that time, engineering education was meant for boys. This is illustrated by an advertisement of 1969 in the 'Rising Nepal', the national newspaper at the time, in which the IOE – then named the 'Nepal Engineering Institute' – called for candidates to apply for studies with an 'age between 17 and 20 years [old] *and with a sound physique*' (emphasis added) (Rising Nepal, 1969; see Annex 14). Evidently, field surveys and construction work in the environment of Nepal required able-bodied persons, but such words also appealed directly to a perceived endurance and stronger bodily physique of boys and men. For the Nepalese students who went to India, this was not any different, the engineering college was a place meant for the cultivation of an army of men. This is aptly illustrated by Figure 3.5, a photo of the 'Nepalese students family' at the University of Roorkee, India in 1983-1984. The photo exemplifies a cultural performance of Elite Manhood *and* the Irrigation Engineer (for the record: there are two female students in the photo). The composition of the picture, quite literally, links images of masculine bodies to carefully structured rows of names, showing in a single dramatic presentation, who (and what bodies) are going to be part of the national elite.

Evidently, it is not just a story of *all* boys and men. For a start, the seat allocation for engineering studies has always been centrally administered. For instance, in the 1980s, the NPC set the targets for engineering education at the IOE in terms of 320 overseers and 96 engineers per year, and by 1989, the IOE had produced no more than a total of 4.000 overseers and engineers, out of a population of 18 million people in Nepal (DHV/APROSC/WB, 1989). Engineering education was thus predominantly available for a lucky few. In the 1980s, the application-admission rate for students at the IOE was 10 to 1, and since then the competition has only grown stronger (Karmarcharya *et al*., 2003). Only applicants with the highest total score at the proficiency certificate examinations (at the end of higher secondary school) and entrance exams are selected for engineering education at the colleges, respectively for 'regular' (subsidized) or 'full fee' paying seats. Applicants have mostly been boys, mainly from the Kathmandu Valley. For instance, in 1971, there were only 3 female graduates in engineering in Nepal compared to 341 male engineering graduates, and this was not much different in agricultural sciences – 3 out of 130 agricultural graduates were female students (Gurung 1972 cited in Udas, 2011: 118). Following government regulations, 10% of the students seats in Nepal at colleges has been reserved for female applicants since the 1970s, provided they pass the minimum criteria and entrance exams (DHV/APROSC/WB, 1989), but this has hardly altered the balance, more so because such quotas were not imposed upon technical schools (WECS/BCESC, 1996: 7). Admission and scholarships for studies abroad were (and are) even harder to get, the competition is strong, and the allocation of scholarships has always been subject to nepotism (ERA, 1973; HMG-N/Winrock, 1980).

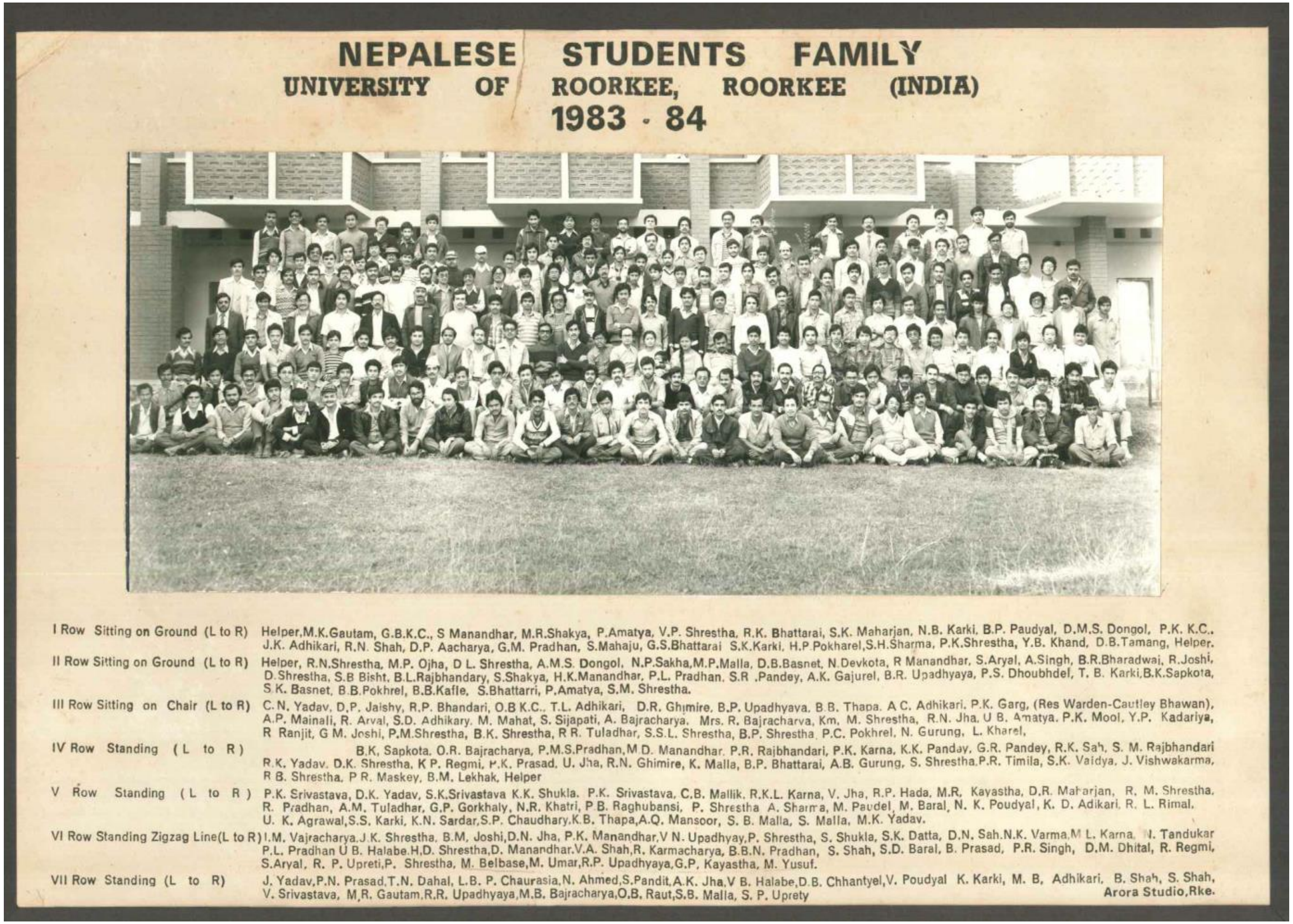
As described, the availability of engineering education in Nepal has increased tremendously during the last two decades. Overall, between 1950-2010, there has been nearly a 50-fold increase in intake capacity in Nepal, just like in India (Parikh and Sukhatme, 2004). Access to it continues to reflect gender, class, caste and ethnicity divisions in society. This is revealed in an analysis of student enrolment at the IOE and 10 private engineering colleges in Nepal in the last 30 years for civil and agricultural engineering, at the diploma, bachelor and master degree level (see Figure 3.6, 3.7 and 3.8). I have not differentiated between bachelor degree civil and agricultural engineering. There is only one place in Nepal for a bachelor programme on agricultural engineering (at least up to 2010), introduced at the IOE, Dharan campus, in 2000 for 24 seats, and the enrolment data reflect the same pattern as in civil engineering.[14] I present these data in the main text, because gender and caste segregated data on education are rare in Nepal. Figure 3.7, for instance, shows the enrolment data for bachelor degree civil and agricultural engineering for about one-third of the engineering colleges in Nepal between 1985-2010. The figure (see top graph in Figure 3.7) shows that more boys *and more girls* enrol now in engineering education, but that the gender bias has remained strong, from 2% female enrolment in 1990 to 10% in 2000 and 15% in 2010. Available figures from literature suggest that this is not unique for engineering studies. For instance, in 1996, female students accounted for 7%, 11% and 6% of the total student enrolment in Nepal, respectively for a

[14] The agricultural programmes at the IAAS in Chitwan do not include 'agricultural engineering' programmes Enrolment data of students at the IAAS have not been collected.

bachelor degree in agricultural science, forestry and engineering (WECS/BCESC, 1996: vii). Within the field of engineering, the male domination in civil engineering is not extraordinary compared to mechanical and automobile engineering which attracts no interest from female students at all (data collection on mechanical engineering at IOE, not presented here). It also shows that caste and ethnic biases have remained unchallenged (see middle graph in Figure 3.7). The total percentages indicate that it has mainly been (urban) men of the B/C castes and Newar people who have benefitted from engineering education (see bottom graph in Figure 3.7). A notable exception are Madhesi men. They also are well represented in engineering studies (to be discussed in conclusions). Exactly the same trend is visible in the collected data for diploma civil engineering (1980-2010) and master-degree disciplines related to engineering and water resources management (1998-2010).

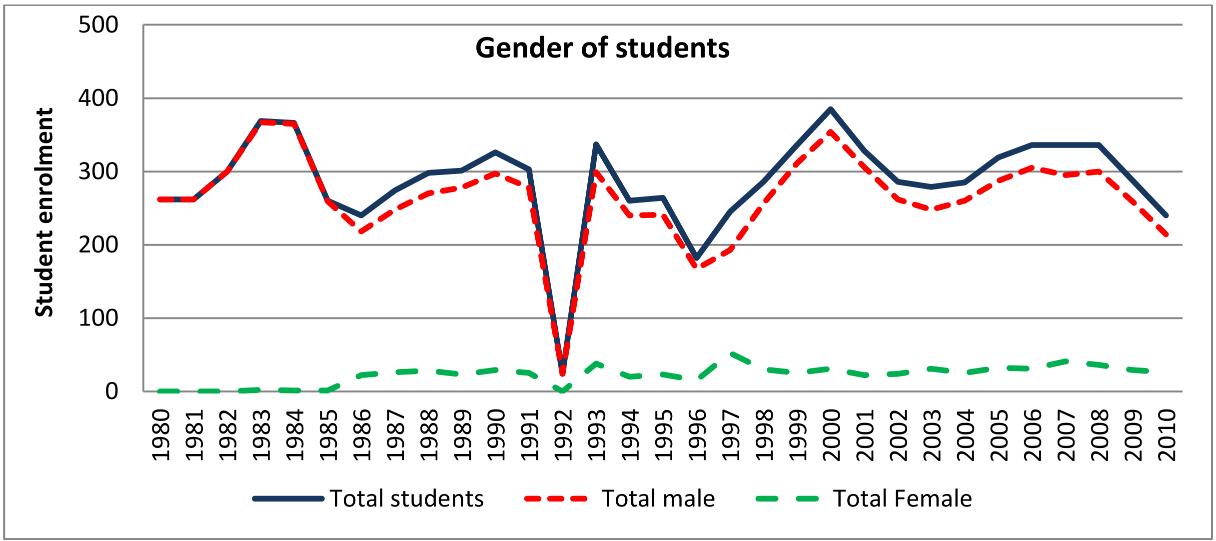
In spite of the prevailing gender biases in engineering education, the data reveal that a steady outflow of female graduate overseers and engineers has been produced for some time now. Yet these women have not pursued a career as an Irrigation Engineer in the civil service, nor do they work in any significant numbers – less than 10% of the technical workforce – as technical personnel in NGOs, INGOs or the consultancy sector (HMG-N/Winrock, 1980; DHV/APROSC/WB, 1989; Karmarcharya *et al*., 2003; *NEC*, 2009). In fact, as a result of their absence in the labour market, female engineering students appear invisible, while they always have been there. Illustratively, the first female Nepalese civil engineer in Nepal is said to have been there in 1966 (Shrestha, 2007), but I have not been able to trace this person. Yet, these data squarely counter the argument of 'men' that there are no female irrigation engineers in Nepal because there is a lack of trained female capacity (WECS/BCESC, 1996; Shrestha, 2007). This argument has always been false (see Chapter 5 for further discussion).

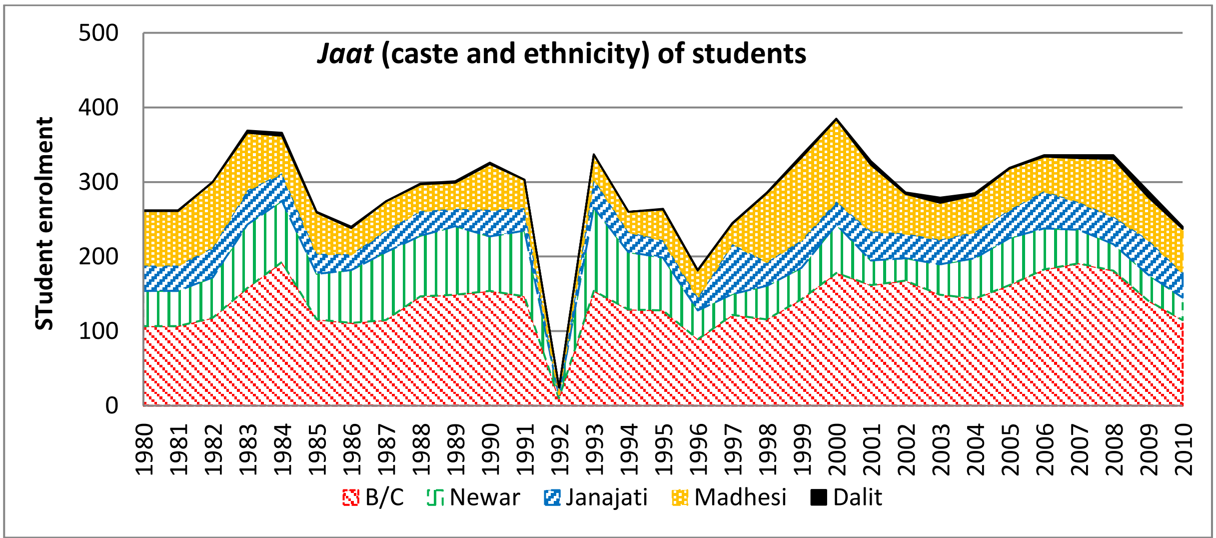
Figure 3.5: Nepalese students in India for engineering education

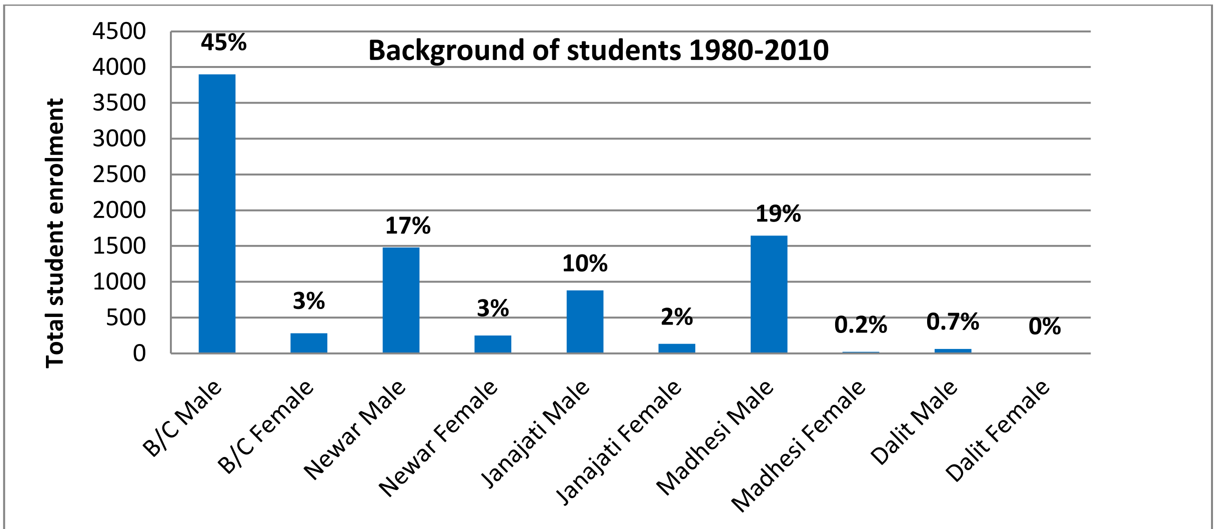


Source: Private collection

Figure 3.6: Background of students for Diploma Civil Engineering at the IOE

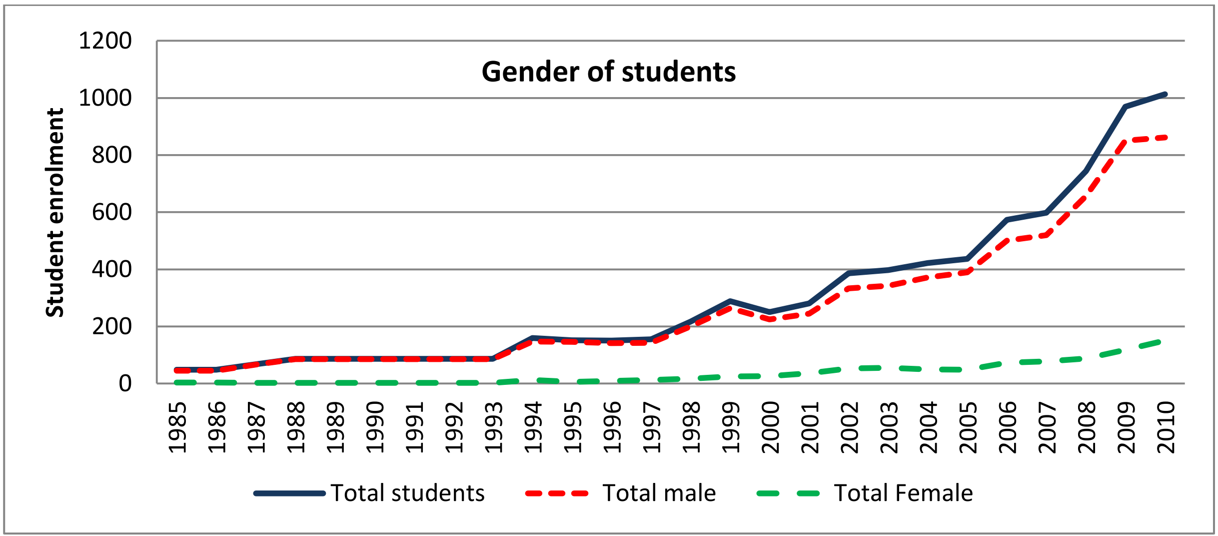


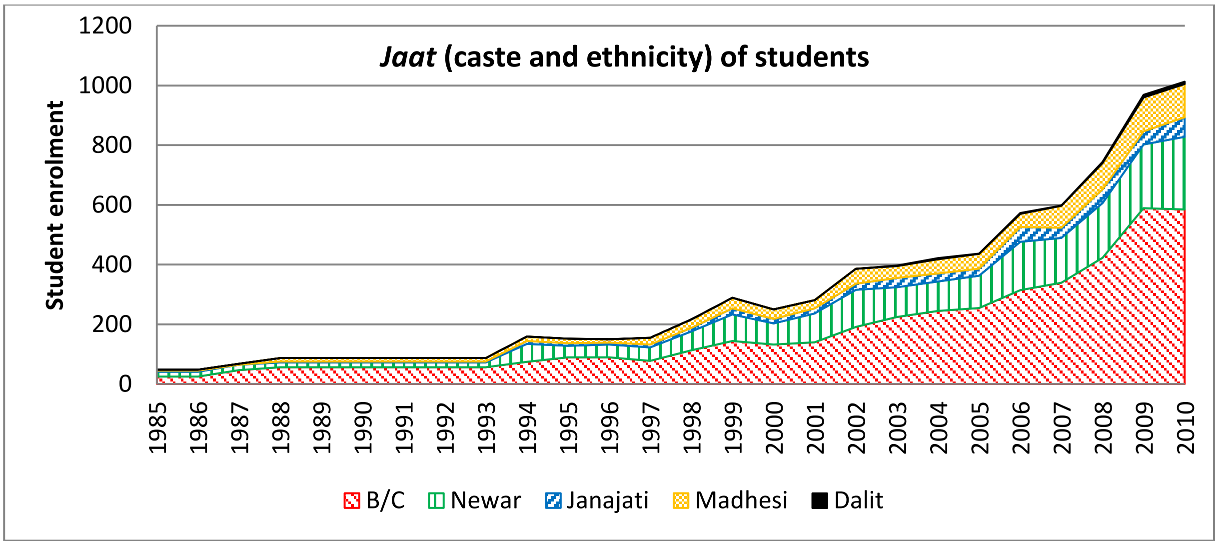


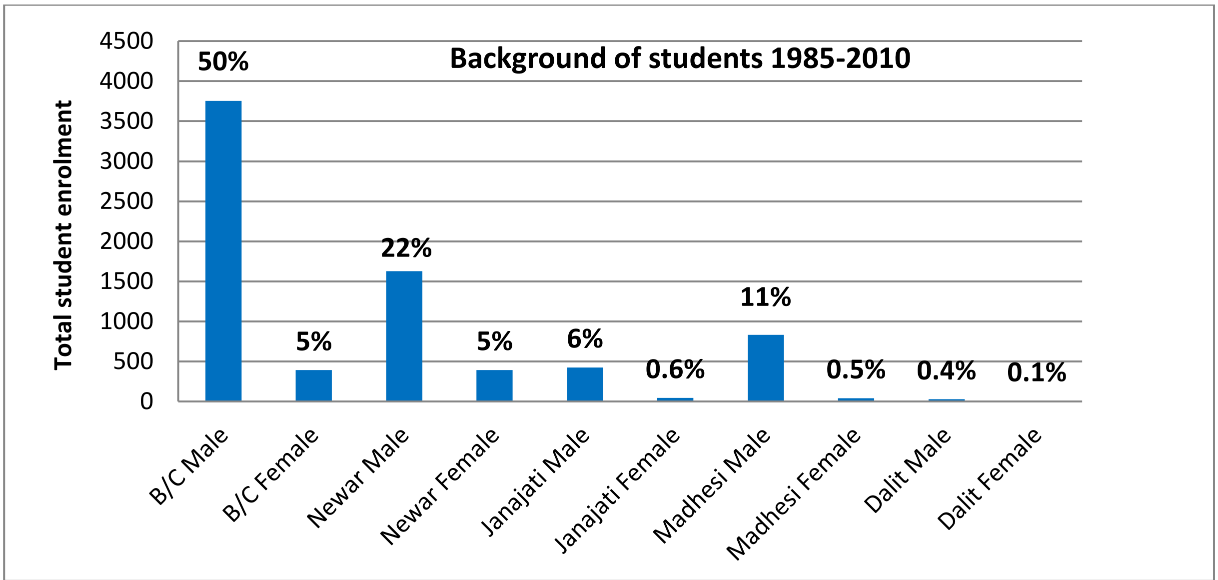


Source: Data collection, 2011. See Annex 15. **Note:** The data in this figure cover the campuses of IOE only and are estimated to cover between 30% and 50% of the total number of seats in Nepal for diploma civil engineering.

Figure 3.7: Background of students for Bachelor Civil and Agricultural Engineering

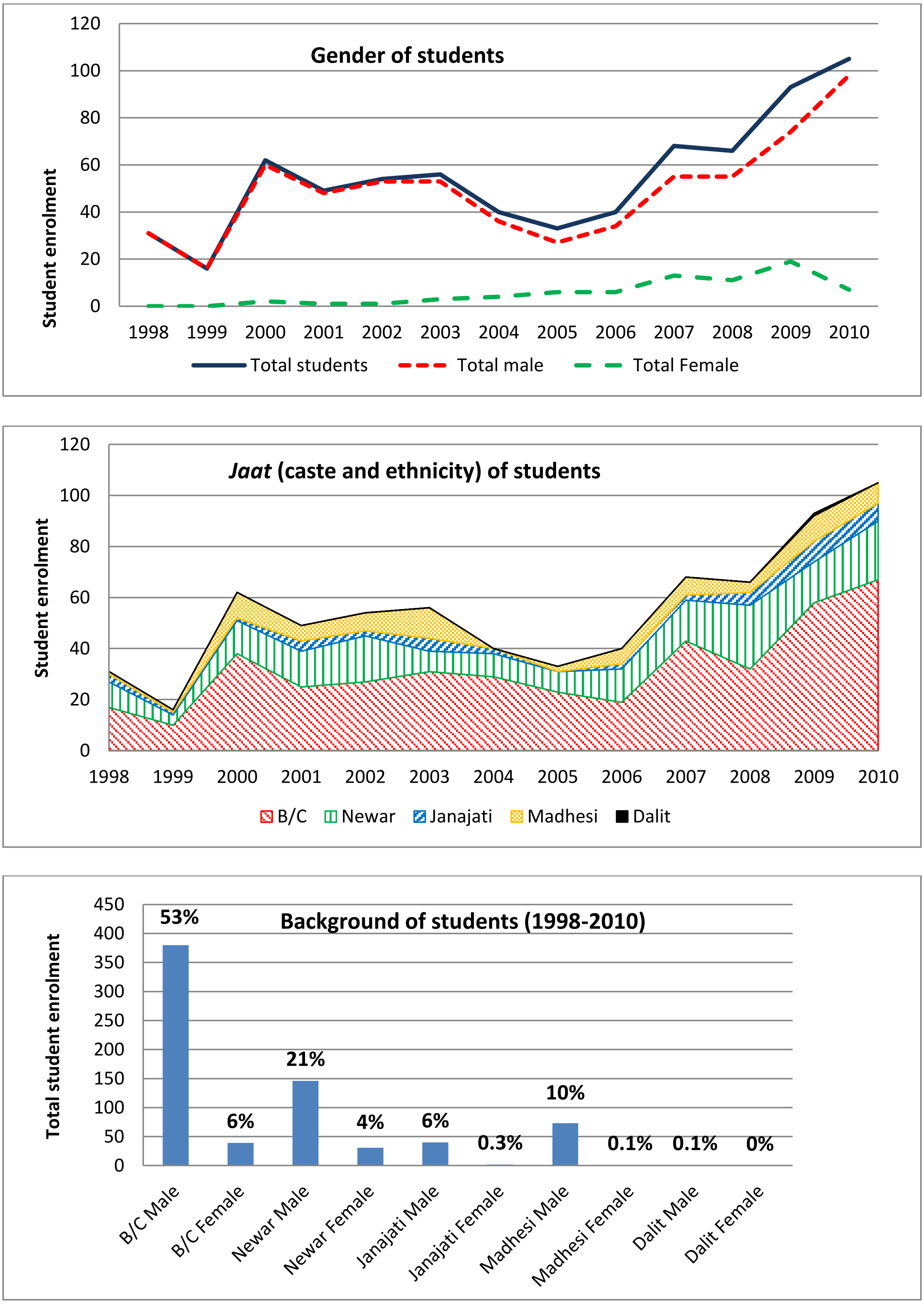






Source: Data collection, 2011. See Annex 16. **Note:** The data in this figure cover about 33% of all colleges (and seats) in Nepal for bachelor degree civil and agricultural engineering.

Figure 3.8: Background of students for Master in Engineering or water related subject



Source: Data collection, 2011. See Annex 17. **Note:** The data in this figure cover all master degree programmes in Nepal on water resources management related disciplines.

Apart from the 10% seat allocation for girls at colleges, there have been some affirmative action policies since the 1990s to increase the access of female students to higher technical education. With the global debate on WID touching ground in Nepal in the 1980s (HMG-N, 1985; UN/ILO, 1992), it produced a realization that there was a link between the lack of female agricultural extension workers and the marginalization of rural women in development projects (Adhikary, 1995). The first report in Nepal that talked about – and separately imagined – 'professional women's concerns', was part of a WID seminar on the 'changing role of women in the water and energy sectors' (WECS/CIDA, 1991: see p. 24-27). This report was soon followed by the first studies on educational and professional development opportunities for women – see a report of 'Winrock International' for the agriculture and forestry sector (Adhikary, 1995) and a report of the 'Water and Energy Commission Secretariat' (WECS) for the water resources and energy sector (WECS/BCESC, 1996). These reports called for expanded quotas at colleges for female students and scholarships to encourage women to join higher technical education. In regard to scholarships for women, Winrock was the pioneering organization (see Annex 18 for other organisations that provided scholarships). In the period 1990-2002, Winrock ran the 'Women Scholarship Programme', funded by USAID and the Ford Foundation (Karmacharya *et al*., 2003; Devkota, 2003). In total 83 women students enjoyed support from Winrock for their studies in higher secondary education (intermediate level) or bachelor degrees, and at least one of them ended up in the irrigation sector, finding employment in 1991 at the WECS under the 'Ministry of Water Resources' (MOWR) (she left in 1994 to pursue studies in Norway) (Devkota, 2003). A more recent initiative is the earlier mentioned master degree programme on interdisciplinary water resources management at *NEC*. Under funding of the Dutch government (2006-2011), 8 out of 10 subsidized seats were reserved for female students (*NEC*, 2008).

The Agricultural Perspective Plan of 1995 and the ninth five-year development plan (NPC, 1995) formalized the call for more women engineers and technicians (Karmacharya *et al*., 2003), but in practice the quotas and scholarship programmes receive the regular critique because they essentially challenge the 'closed' education system of merit-based allocation of seats. It is thus no surprise that none of the scholarship programmes have been institutionalized (Devkota, 2003). Illustrative is also that the call of WECS in 1996 to expand quotas at engineering colleges for female students from 10% to 30% was ignored (WECS/BCESC, 1996: ix) Most (women) scholarship programmes of the 1990s also have been criticized for the neglect of ethnic and disadvantaged groups in society, such as people from remote areas, public school graduates, Janajati, and Dalits. Indeed, mainly high-class, upper-caste, urban B/C and Newar girls have benefitted from these scholarships (Adhikary, 1995; WECS/BCESC, 1996). Most grant programmes that exist today take these factors into account, but also these new scholarships fail to address the structural gender, class, caste and ethnic disparities that exist in the education system of Nepal.

3.3 Institution two: Professional regulation and engineering associations

Regulatory organizations for the engineering sector in Nepal exist since 1989 and are thus a relatively recent phenomena. Engineering associations in Nepal – alumni networks, professional societies, national or international organizations – vary in size and level of activity, and many of them are national chapters of international organizations. There also are many Nepalese engineers who are members of professional societies abroad.

3.3.1 Regulatory organisations for engineering in Nepal

Two regulatory institutions for engineering have already been mentioned. In 1989, the 'Council for Technical Education and Vocational Training Act' was promulgated by the government to regulate and monitor engineering education at the technical schools in Nepal, from technical SLC to diploma level. This was followed in 1999 by the 'Nepal Engineering Council Act' to set norms and standards for the engineering profession and engineering education in Nepal, from the bachelor to master and PhD level. The CTEVT council was established as a member organization of the 'Colombo Plan Staff College for Technician Education', established in 1969 under the earlier mentioned Colombo Plan, and was conceived as a government body from the start. The CTEVT council is chaired by the 'Ministry of Education', and has representatives of the NPC, as well as from business, industry and the technical schools (see Annex 20 for details).

In contrast, the NEC was mostly an initiative of the 'Nepal Engineers' Association' (NEA), which can be considered *the* national association for engineers in Nepal (see below). The council is chaired by the president of the NEA, has five representatives of NEA, as well as from the IOE for example. The NEC was essentially conceived by the NEA to regulate the growth of the engineering profession in Nepal, and to control the membership in the COP of professional engineering. The NEC initiated the registration and licensing of individual engineers as members, by name and number (to be mentioned at project documents), established a professional code of conduct, and operates – like the CTEVT for technical education – as a 'quality assurance cell' for the engineering sector, both at the professional level and for academic education. The NEC is still in the process of building up its organization. As per 2011, the NEC had registered (and licensed) 15.343 engineers in a total of 32 engineering disciplines and registered 33 engineering colleges. These numbers indicate the level of growth and diversification of engineering in Nepal in the last two decades and reveals that 'engineering' is no longer synonym with civil engineering in Nepal.

In a similar fashion, the 'Society of Consulting and Architect Engineering Firms' (SCAEF), established in 1990 by consultant engineers, came to assume regulatory powers. In 1995, this organization was recognized by the government as the 'national body' for consulting firms, and was assigned to cooperate with the Ministry of Physical Works and Planning. Following the 'Public Works Directive' of February 2002, consultancy firms need registration with the SCAEF to be eligible for shortlisting and participation in bidding processes. As per 2013, the SCAEF registered and monitored 75 Nepalese engineering consultancy firms. In this context, it is noteworthy that the 'Federation of Contractors' Associations of Nepal' (FCAN), also established in 1990 and representing 253 construction companies, has not been able to assume regulatory powers. The government of Nepal has instituted regulatory councils for the construction sector, but the FCAN does not have a seat in these councils.[15]

3.3.2 Professional engineering associations in Nepal

Engineers employed in the irrigation sector, mainly for the government, but also for consultancy and contractor firms, reported their membership for more than 30 professional associations, including the ones named above: NEA, SCAEF and FCAN (See Annex 20 for a complete list and background information). The oldest professional societies in which Nepalese engineers are involved are located abroad, notably the 'Institution of Civil Engineers, India' (ICE-I) and the 'Institution of Engineers, India' (IEI), established respectively in 1860 and 1920. The ICE-I and IEI are basically a copy of the British 'Institution of Civil Engineers' that was established in 1818. In 1992, the IEI opened an office in Kathmandu for members in Nepal. Other international organizations that have Nepalese members are, for example, the 'International Water Association' (IWA), the 'Indian Water Resources Society' (IWRS), and the 'International Water History Association' (IWHA).

The first home-grown professional association in Nepal was the 'Nepal Agricultural Association' (NAA), established in 1960 by agricultural graduates who had assumed government service. It used to publish the first agricultural journal in Nepal, but the association has been idle since the 1980s. In 1968, the NEA was established, and in 1980, the 'Diploma Engineers Association, Nepal' (DEAN). These associations are the most important professional engineering organisations in Nepal, respectively for engineers and diploma engineers or overseers. As per 2011, the NEA had more than 12.000 members, and the organization can be considered the Nepalese equivalent of the Institution of Engineers that exists in India, Bangladesh, Pakistan, and Sri Lanka. It has four country offices in Japan, Qatar, Bangkok and Australia, is a member the regional 'Federation of Engineering Institute of South and Central Asia' (FEISCA), and a member of the 'World Federation of Engineering Organizations' (WFEO). The DEAN had more than 25.000 members, which makes it the biggest engineering association in Nepal, and it is a member of the regional 'SAARC Diploma Engineers Forum' (SDEF) and a member of the 'Mid-level Engineers Forum in Asia and the Pacific Countries' (MEFAP).

[15] There are tensions between contractors and the government. See: www.fcan.org.np (visited May 2013).

Other professional engineering associations in Nepal have been established more recently, focussing on specific professional fields or engineering disciplines, and are much smaller in size. For instance, the ‘Society of Public Health Engineers, Nepal’ (SOHPEN), modelled after its British sister, was established in 1990 and had 274 members (SaciWaters, 2011). Other examples are the ‘Structural Engineers’ Association Nepal’ (SEANep), established in 2002, and the ‘Nepal Engineering Infrastructure Development Society’ (NEIDS), established in 2007. Out of these two associations, the NEIDS was most active with over 200 engineers and overseers as member, promoting the building of infrastructure in the water and power sector, and maintaining an office building in Kathmandu.

Then, there are a number of alumni associations. For instance, the ‘JICA Alumni Association of Nepal’, established in 1973 by Nepalese trainers and students under the academic education programme of the Japan International Cooperation Agency (JICA). As per 2011, it had 959 members. Other examples are the ‘Japanese Universities Alumni Association Nepal’ (JUAAN), established in 1995 with 226 members; the ‘AIT Alumni Association Nepal Chapter’ with 799 members; the ‘IIT Roorkee Thomason Alumni Association Nepal Chapter’, established in 1996 with 241 members; the ‘Association of British Alumni Nepal’ (ABAN), established in 1997 with 482 members, and the ‘IOE Alumni Association’ (IOEAA), established in 2005 with 213 members. Most of these associations do not exclusively cater for engineers, the ABAN for example is an organization for all Nepalese students that went to Britain, and not all of these associations were active, the ‘Thomasonians’ for example were said by the chairman to be in a dormant stage after 2004.

In relation to the irrigation profession, there are a number of small professional organizations. The first is the ‘Nepalese Society of Agricultural Engineers’ (NSAE), established in 1990, with about 200 members, but it is largely inactive now. In 1998, at an international meeting in Chitwan District, where the progress of PIM policy in Nepal was discussed by donors and the government, the Nepal chapter of the WB-based ‘International Network of Participatory Irrigation Management’ was established by engineers of the DOI (INPIM/N). Likewise, the DOI also obtained an institutional membership of the ‘International Commission on Irrigation and Drainage’, as the ‘Nepal National Committee’. Unlike in India – the ICID was established in India in 1950 – this organization does not have a big footprint in Nepal. In 1998, with a small grant of the Ford Foundation, the ‘Farmer Managed Irrigation System Promotion Trust’ (FMIS Promotion Trust) was established by a few devoted irrigation professionals. Although no member organization, the trust organized five international conferences in Kathmandu in the period 1998-2010 on FMIS research. In 1999, the ‘Nepal Water Parnersthip/Jalsrot Vikas Sanstha’ (NWP/JVS) was established, also by devoted irrigation professionals. This organization is the national chapter of the ‘Global Water Partnership’ (GWP) and focusses on the promotion of Integrated Water Resources Management (IWRM). In 2006, this organization had 131 members, mainly among engineers, researchers and consultants (NWP/JVS, 2006). And in 2003, at the occasion of the golden jubilee of the DOI, the ‘Society of Irrigation Engineers Nepal’ (SIREN) was established. The then minister of MOWR, Dipak Gyawali had a role in this, to promote professional civic leadership (Gyawali, 2009: 309). It has about 200 members, mostly DOI engineers, but it turned inactive soon after it was set up.

Two associations make up their own category. Recently, in 2013, the earlier mentioned Nepal Engineering College set up the ‘Nepal Civil Engineering Students Society’ (NCESS), an effort to gather civil engineering students. This initiative indicates that professional organization is now also introduced among the student population. The other initiative is the ‘Nepal Engineers’ Wives Society’ (NEWS), set up in 2001 by some women married to engineers. Unlike the abbreviation ‘NEWS’ suggests, there is not much new about this initiative. The women who founded this organization took inspiration from the ‘Nepalese Army Wives Association’ and its equivalent for the national police service. These organisations are elite upper-caste charity associations for ‘women’s empowerment’, combining charity activities like micro-finance, environmental clean-up campaigns, blood donations, eye check-ups and breast cancer briefings with the promotion of Teej and Hindu culture.[16] In Nepal, the occasions of the Nepalese Army Wives Association are known as a time and place where high-ranking army officers can show off with their wives, and where married women and daughters can parade with dress, jewellery and glamour. As per 2011, the occasions of NEWS did not have such a status, but with the activities being visited by whole families rather than by single members, and with more than 500 members within 10 years, the association was well underway in becoming the sister of the NEA – the ideal of NEWS.

Other initiatives that need mentioning here are the incipient ‘networks’ of women professionals that exist in Nepal. Most of these networks however are related to foreign initiative, and become inactive once donor support and external funding falls away. For instance, the network of ‘Women Professionals in Land Use Sector’ (WPLUS) was an outcome of a meeting in 1997 that was organized for women professionals in agriculture, water management and irrigation by the ‘International Centre for Integrated Mountain Development’ (ICIMOD). In the following years, WPLUS obtained some profile through various meetings and activities, receiving logistical support of Winrock International (SaciWaters, 2011). However, in 2011, it was no longer found active except for an Yahoo-group of WPLUS on internet. In a similar fashion, (1) the NWP/JVS initiated the ‘Woman Water Network’ (WWN) in 2001 due to influence of the GWP, (2) the Centre for Rural Technology, Nepal (CRT/N) hosted the ‘Gender, Energy and Water Network, Nepal’ (GEWNet) in 2002, receiving support of the Netherlands-based ETC Foundation, and (3)

[16] Teej is a Hindu festival in which upper-caste women are expected to fast for the wellbeing of the husband, or in case they are not married yet, are expected to fast to make sure that they get a good husband.

NEC launched the 'Professional Women for Promotional Activity, Nepal' (PWPA-Nepal) in 2007 under support of the Dutch-funded Indian NGO SaciWaters. As per August 2011, WWN, GEWNet and PWPA-Nepal were found to be no longer active and in a dormant stage.

3.3.3 Who has access to regulatory organisations and engineering associations?

Formal membership of the regulatory organisations in engineering and the engineering associations follows strict eligibility criteria. Membership in the executive councils of the CTEVT, NEC and the SCAEF can only be obtained through nomination or election. The CTEVT is governed by an assembly of 24 member organisations, such as the Ministry of Education, the NPC, and representatives of technical schools; and a council of 9 member organizations. The chair of this council, the Minister of Education, is entitled to nominate no less than 4 out of the 9 members. With cabinet ministers changing frequently in Nepal, this implies that the council of the CTEVT is subject to partisan politics. The executive council of the NEC has 12 seats of which 6 are controlled by the NEA, and the organization is therefore less subject to partisan politics. Both the president of the NEA, who chairs the NEC, and the five NEA members who take up seats in the council, are elected by the members of the NEA every 2 years. Usually, these are senior and experienced members of the NEA. Likewise, the executive committee of the SCAEF has 11 seats and draws its members from the affiliated consultancy firms (75 in total). Also these tend to be senior and experienced engineers.

These circumstances – the nomination and election of senior and experienced engineers – make the councils and executive committees of the regulatory organisations very masculine domains which are controlled by an exclusive group of high-class, upper-caste B/C and Newar men, and to a lesser extent Madhesi men. The only regulatory organization that provides for individual registration, the NEC, had registered in 2011 in total 1.813 female engineers, mainly computer and civil engineers, and architects (see Annex 19). This number accounted for 12% of the membership in the NEC. Yet, female members were absent in the executive council of the NEC. Generally, in case there are female engineers in the regulatory councils, they participate as 'women' and they have been nominated for the council or requested to stand for elections, to assure formal representation of women. In other cases, there was established a special committee for women affairs, and members of these committees were typically high-class, upper-caste women. For instance, the contractors association FCAN – strictly speaking not a regulatory organisation – had a special committee for women affairs with female members only, the 'Female Contractors Coordination Committee'. All other committees of the FCAN, 29 in total, were controlled by men.[17]

For the engineering associations, the situation is not much different. The typical minimum requirement for membership is the completion of engineering education, that is, technical

[17] This information is obtained from the website: www.scaef.org.np, visited on 3-5-2013.

SLC or diploma level for the DEAN, and bachelor level for the other associations, notably the NEA, the NSAE and the SIREN in Nepal, and the ICE-I and IEI in India. As discussed above, engineering education has mainly been accessible for high-class, upper-caste B/C, Newar and Madhesi people, and subsequently, membership of engineering associations has thus only been available for these people. This is also true for many alumni associations, notably the JAAN, the JUAAN, the IIT Roorkee Thomason Alumni Association (Nepal Chapter), and the AIT Alumni Association (Nepal Chapter). Especially the latter two are numerically dominated by male engineers for the simple reason that it was mainly boys who went to Roorkee in India and to the AIT in Thailand for their studies in civil engineering. The associations that aim to operate more like 'open' networks have adopted more flexible membership criteria, such as the INPIM network and NWP/JVS in Nepal and the Indian Water Resources Society (IWRS) in India. In principle, these associations are open to anyone with an interest in water and irrigation, but in practice, also these associations draw their membership among mainly male water professionals and engineers. An exception here are the networks for women professionals, notably WPLUS. This organisation has mainly attracted women professionals and female engineers.

In addition, the more prestigious associations have a policy that new members can only be introduced through the recommendation of existing members. For example, in the case of the NEA, an existing member must propose the application of a new member, and 'his' application must also be 'seconded' by another member. And this is only for ordinary membership, as all engineering associations have a hierarchical membership structure. For instance, the NEA has a classification of 'ordinary member', 'life-long member', 'fellow', and 'honorary member'. Life-long membership can only be applied for after five years of membership, upon request of another member or when a member has passed the age of 60 years and has paid the membership fee for the past 25 years. Fellowship can only be obtained after a membership of 10 years, with the minimum age requirement of 35 years old, and having been continuously involved in the engineering profession, and honorary membership can only be granted to a 'reputed' person who has safeguarded the interests of the NEA. Honorary membership is meant, for example, for the founding members of the association. Some associations, like the ICID/Nepal National Committee, allow for corporate or institutional membership only.

Most associations are formally registered with the government, and have a constitution, bye-laws and elaborate rules and regulations. Most of the written rules are about the regulation (and possible termination) of membership. In sum, the informal practices of nomination and being introduced through existing (senior) members, and the formal policies of membership eligibility criteria, function as a carefully constructed project of professionalism and 'Nepalese' masculinity. It is mainly male Nepalese engineers who have access to these associations, and membership is not available for all men who aspire for it. For instance, foreign water professionals and engineers (from the West) can perhaps formally become a member, but this rarely happens in practice, and when it does, those men are expected to adapt their attitude and act Nepalese. This can be illustrated with my membership of INPIM/N. I participated in talk programmes and gave a presentation on my work in the 3rd meeting programme on 7 January 2010. The members of INPIM/N were aware that I did not master the Nepalese language – I had requested to give the presentation in English as happened more often at INPIM/N talk programmes – but I was introduced in Nepalese nonetheless and received questions in Nepalese. The message of this practice was clear to me – this is a Nepalese network, meant for Nepalese water professionals.

This example illustrates that engineering associations function simultaneously as organizations where the profession is cultivated *and* as cultural institutions where ideals of Elite Manhood are performed. This also is aptly illustrated by Figure 3.9, a photo of the celebrations of 'Engineers' Day' of the NEA in Kathmandu in 2011. It is not difficult to see here that the celebrations of Engineers' Day have all the characteristics of a standard social event in Nepal or common cultural performance – a theatre play with actors, a stage, an audience, a set, lighting, and even a camera to document the show. The theme of the day is 'steps toward empowering engineers for prosperous Nepal' – projected in writing on the background decor. As a spectator, the dramatic effect of the social event (and show) is obvious, it is no longer possible for the observer to meaningfully detach male bodies from engineering or from the cause of the Nepalese nation. This makes the cultural performance of occasions like Engineers' Day very masculine, because those events are simultaneously about the cultivation of the engineering profession (the technical dimension) *and* the re-enactment of ideals of Elite Manhood (the cultural dimension) (McKenzie, 2001).

Figure 3.9: Engineers' Day celebrated by the Nepal Engineers' Association

Source: Own photo, 2011

This is essentially what Fraser (1997) identified as the interactions within the public domain that are governed by protocols and styles of decorum that inherently carry connotations and markers of gender difference and inequality. It is the masculinity of protocols and styles of decorum – quite literally – which make the occasions of engineering associations like the NEA such 'alien' places for women professionals and for any other differently-bodied persons, such as Nepalese professionals of 'low caste' or ethnic origin, and foreign (Western) professionals. This does not mean that women are absent at such occasions, on the contrary. Conservatively dressed, upper-caste, women and female bodies (e.g. colourful saris, women with make-up, traditional jewellery and long black hair), add to the masculinity of the associations. Illustratively, there also was one such a woman and female body on the stage (see Figure 3.9). A quick body count during the occasion of the Engineers' Day suggested that one-third of the audience consisted out of women. Yet, the majority of these women were present as wives or spouse, not as engineers. This illustrates that high-class, upper-caste women have mainly (or only) access to engineering associations through their husbands and fathers – not through formal membership.

In this perspective, NEWS, the association for engineers' wives, is thus one of the most visible products (or expressions) of the masculinity of the engineering profession. The activities of this organization (publications, newsletters, talk programs, gatherings, exhibitions, charity activities and seminars) – activities similar in the engineering and alumni associations for men – are only accessible for women as wives or spouse of engineers. Women can only become a member of NEWS, when their husband is registered as an engineer with the NEC, or when he is registered as a member with the NEA.

3.4 Institution three: The Department of Irrigation

There are institutional histories available of the DOI, discussing its development in detail (see Poudel, 1986; Shukla and Sharma, 1997; Sharma, 2004; Dhungel and Pun, 2009). Here, the purpose is (only) to provide a feminist reading of the history of the agency and I have been selective in the projects, funding and institutional partners of the DOI that I discuss.

3.4.1 The early years of the department (1950s and 1960s)

The history of the DOI starts in 1952 with the establishment of the 'Canal Department'. It started with one room in Singa Durbar and was placed under the newly established 'Ministry of Public Works and Transport' (DOI, 2008).[18] Under the Shah and Rana rulers, public works (read: royal works) had been awarded a low priority. A *banaune adda*, literally construction bureau, is said to have existed since 1769, but little is known about its output. The Ranas initiated two offices for construction works – the *sardar public niksari adda* (central public

[18] The website of the DOI mentions that the department was put under a different ministry, namely the Ministry of Construction and Communication. See: www.doi.gov.np/about, visited on 14-5-2013.

works bureau), and the *public works madhes pahad report Niksari adda* (central public works bureau for the Terai and Hills).[19] Under the Ranas, the first iron bridge over the Bagmati river was built in the 1850s, and a first modern water supply system was constructed between 1888-1895. In 1934, a new office was set up, the *jena seva bibhag*, generally translated as the public service or public works department.[20] This organization was one of the 45 smaller offices in the administration of the Ranas (Stiller and Yadav, 1978). It undertook water supply works, sewerage collection, street maintenance and road lighting. In the period 1932-1945, it also hired Indian engineers to initiate irrigation development in the Terai and set up three local irrigation canal offices (*nahar shakhas*) in Biratnagar, Birgunj and Taulihawa under the administration of the district governors (*bada hakim*) (ADB/APROSC, 1990: 10). The public works department is generally portrayed as the ancestor of the DOI. In comparison, a decade earlier, the 'Board of Agriculture' or 'Agricultural Council' had been established in 1924 with the opening of a demonstration farm in Singa Durbar (Skerry *et al*., 1992: 24). This organization is said to have been responsible for agriculture and irrigation activities (P. Pradhan and Yoder, 1990), and is generally perceived as the ancestor of the DA (also formally established in 1952). The irrigation (engineering) and agricultural profession in Nepal emerged thus quite early as separate (and competitive) disciplines and organisations, just like in India (FAO, 1969; Chapagain, 1972; B.B. Pradhan, 1982).

The Canal Department was initiated by a retired Indian irrigation engineer from the Punjab, Kartar Singh Garcha (DOI, 2008), and was thus an Indian invention, just like the Ministry of Public Works and Transport. In contrast, the DA was largely an American invention, as the USAID provided critical initial advisory and financial support for the DA (FAO, 1969; USAID, 1972). Garcha became the first chief engineer of the Canal Department, because there were no Nepalese engineers to take up the position. Under British-Indian rule, the Punjab Irrigation Department had built large canal systems to supply water to farmers' fields (Gilmartin, 1994). This working modality, based on the Indian administrative system for the execution of public works – the systematic implementation of public irrigation systems by civil engineers – was adopted by the Canal Department. Its primary goal became the organized construction of dams and canals *throughout* the country, also occasionally known in literature as the hydraulic mission (Wester, 2008; Molle *et al*., 2009) (see Chapter 7 for more information). The fact that the department was largely financed in its early years by India, helped to institutionalize this vision for irrigation development. In the 1950s and early 1960s, the Indian Aid Mission invested roughly 15 times more than the Americans in irrigation infrastructure in Nepal (IAM, 1964). Illustratively, these two countries competed for

[19] A history of these offices and their activities is presented on the website of FCAN. See: www.fcan.org.np, visited on 12-5-2013.

[20] ADB/APROSC (1990, see p.10) mentions this organization under a different name, namely the *chhemdel banaune adda*.

influence (Sakiyama, 1971; Maskey, 1978), and the Americans came to view the Indian emphasis on public works as the 'bricks and mortar' mentality (Skerry *et al*., 1992: 43).

It took until 1956, with the start of planned development, for irrigation development, or better to say canal construction, to get underway. The objective of the department had to be toned down due to a lack of capital funds and human resources, and the focus was on the rehabilitation of existing systems and the building of relatively small systems in the Terai that supplemented the monsoon rains for paddy cultivation (Sakiyama, 1971; Sharma, 2004). In 1957, the department was headed by the first Nepali chief engineer, Medini Nath Battrai (DOI, 2008). Three years later, in 1960, the department was placed under the 'Ministry of Health, Canal and Electricity', and renamed in 1961 as the 'Department for Irrigation and Drinking Water' (DIDW). At that time, the department was hardly able to fulfil the tasks that it was envisaged to do – the construction of big, technically demanding, and capital intensive water projects – even though the agency was strengthened with young civil engineers who had completed their studies in India and Russia (DOI, 2008).

Meanwhile, in 1962, the first country-wide irrigation programme, called the 'Minor Irrigation Programme' was launched but not under the auspices of the DIDW. This programme was institutionalized as a division under the DA, only later under the DIDW, and focussed on the provision of low-cost irrigation facilities to farmers (Rising Nepal, 19 December 1966; Agrinaut, 1967; Koirala, 1967; Sakiyama, 1971; Sharma, 2004). This particular case illustrates that the early irrigation department had no monopoly on irrigation development and that bureaucratic competition then was recurrent in the public administration, not least between engineers and agriculturalists in the field of irrigation. In fact, it was not the first occasion and certainly not the last, when professional interests between these groups would clash. Illustratively, in 1965, the irrigation department appears to have been shifted once again. This time under the newly established 'Ministry of Water and Power' (MOWP) (Nepal, 1967; Shrestha, 2001).[21] This appears to have taken place amidst a shift in government planning to specific rural development agencies with a professional focus away from a community level focus, as it also happened in India. This bureaucratic reshuffle – in this case accomplished through the establishment of a new water ministry – demonstrates that the water engineering profession and the hydraulic mission vis-à-vis the agricultural profession gradually acquired a more prominent role in efforts of nation building (FAO, 1969).

[21] I use the name 'Ministry of Water and Power' in the main text, because Shrestha (2001) writes that a new ministry was established in 1965 under this name (see also USAID, 1972). However, Nepal (1967) mentions the 'Ministry of Irrigation and Power', the USAID (1972) also talks about the 'Ministry of Agriculture, Food and Irrigation', and the WECS (1979) mentions the 'Ministry of Water, Irrigation and Power'.

3.4.2 From irrigation to water resources engineering (1970s and 1980s)

Starting in 1970, with the production of the first irrigation master plan for Nepal (HMG-N, 1970b), under the auspices of the MOWR (previously the MOWP), the government started to invest massively in large-scale irrigation development in the Terai, made possible by loans and grants from foreign donors, notably the WB and the ADB. In 1972, the department was re-organized with an expanded mandate and named the 'Department of Irrigation, Hydrology and Meteorology' (DIHM). At the same time, however, it was placed under the 'Ministry of Food, Agriculture and Irrigation' (MFAI) – not under the MOWR (P. Pradhan and Yoder, 1990; DOI, 2008). This was good and bad news for irrigation engineers. On the one hand, the DIHM obtained the position to become the *lead agency* for water resources engineering in the country. It had acquired the responsibility for the collection (and control) of hydrological data (B.K. Pradhan, 2009) and ditched the responsibility for drinking water supply – a field generally awarded a minor interest by water resources engineers. On the other hand, the department was placed under a ministry that was essentially in control of agriculturalists, precisely in a period that many other government agencies were claiming a say in irrigation. In 1968, the 'Agricultural Development Bank of Nepal' (ADB-N) started investments in irrigation through an intensive loan programme for pump irrigation and small gravity schemes (P. Pradhan and Yoder, 1990). It executed the programme through its own offices and technical personnel. In 1970, the 'Department of Minor Irrigation' was established under the 'Ministry of Panchayat and Local Development' (MPLD). This department channelled irrigation projects through the district technical offices of the MPLD, and through the chairman of the district panchayats (P. Pradhan and Yoder, 1990). In addition, in 1973, the 'Farm Irrigation and Water Utilization Division' (FIWUD) was established under the DA, a department that functioned basically as the *first* line agency of the MFAI (Sharma, 2004). The placement of the DIHM under an agricultural ministry must have been a concern for irrigation engineers, and for members in the COP of the Irrigation Organization in general, because agriculturalists competed directly with them over mandates and resources, as well as on visions for irrigation development. At the same time, with so many organizations focussing on 'minor irrigation', the DHIM engineers saw an opportunity to focus on big water engineering works, and leave the job of water management up to the DA (FAO, 1969).

Yet the (arranged) marriage of the DIHM and the MFAI was not to last, and the engineers of the DIHM in cooperation with foreign members in the COP of the Irrigation Organization, appear to have worked tirelessly to claim their 'own' ministerial planning body and accomplish a return (or transfer) to the MOWR.[22] They did not have to wait long for an opportunity. In 1976, the 'Canadian International Development Agency' (CIDA) started an 'energy review mission' (WECS, 1979). In the same year, the government of Nepal

[22] P. Pradhan and Yoder (1990) talk about the 'Ministry of Electricity and Power' for this period.

established a high-level planning body for water resources development, the ‘National Water Resources and Energy Commission’ (NWREC). This commission was to function apart from any single department under multi-ministry representation, and it was to advise the NPC – the highest planning authority in the country – on issues of water resources development. The NWREC received considerable backing from the king, who appointed his brother as an advisor on the commission (WECS, 1994). Initially, the engineers of the DIHM and from the Department of Electricity were reluctant to work for the NWREC, because it fell outside the structure of the line agencies and they perceived the activities of the NWREC as a direct threat to their authority. As a result, the organization was inert for three years (WECS, 1979).

This changed when the Canadians engaged with the NWREC. Canada had become involved in studies on energy and water resources development in Nepal in the context of bilateral issues between Nepal and India. The Canadians had experience in dealing with long and tenuous negotiations on trans-boundary water issues with the US (B.K. Pradhan, 2009). As described, bilateral water issues between Nepal and India were (and are) a recurrent concern for members in the COP of the National Elite and for engineers of the DIHM in particular, and they welcomed the Canadian assistance. In cooperation, the NWREC was re-imaged as the highest planning authority in the water sector, with the goal to develop ‘multiple approaches to water resource[s] development’ (WECS, 1979: 15), and it was renamed as the ‘Water and Energy Commission Secretariat’ (WECS). This time, it was conceived as a separate planning unit under the MOWR, effectively putting it under control of the DIHM. The Canadians had preferred to keep the WECS as a multi-ministry planning body, but eventually they went along with the concerns of DIHM engineers because they realized that otherwise ‘the danger would exist that all its wisdom [of WECS] regarding strategy and policy would amount to little more than pious hopes’ (WECS, 1979: 19). In 1980, the DIHM was placed (back) under the MOWR (WECS, 1984a), and the WECS was permanently established under the ministry in 1981. The WECS was given credence by the presence of the ‘Canadian International Water and Energy Consultants’ (CIWEC) who worked in conjunction with DIHM engineers as their counterparts. In one go, DIHM engineers had thus re-acquired an overarching ministry for water resources development (MOWR), secured control over the highest water advisory body in the country (WECS), and obtained access to international cooperation for solving trans-boundary water issues with India (through CIWEC).

By that time, the MOWR and its line agency the DIHM, had grown into a sizeable bureaucracy, employing 575 engineers (WECS, 1984a: 6). However, these engineers had little time to enjoy ‘their’ acquired position. In 1981, the Canadian consultants, saliently under the name of ‘WECS’, produced an ‘irrigation sector review’ with devastating conclusions for the COP of the Irrigation Organization in Nepal (WECS, 1981). It stated that only 100.000 hectares (42%) of the 240.000 hectares irrigation command area developed by the government was, in fact, irrigable, and it emphasized that projects had been started on non-economic grounds, beyond a tolerable limit of trade-off (WECS, 1981). In short, it concluded that big, centrally managed, technically demanding and capital intensive irrigation projects did not work and were a waste of resources. Amidst Nepal's balance of payment problems, these words were welcomed by international donors and cash-strapped administrators who called for decentralized and more efficient forms of irrigation development (HMG-N/ADC, 1983). These calls effectively put under scrutiny the *raison d'être* of the DIHM. In particular, the rigid division of tasks between the DIHM and the DA, between system construction and irrigation management – a division of tasks that DIHM engineers had nurtured carefully – was identified by donors and administrators as deeply unsatisfactory (WECS, 1982). This resulted in strong policy calls for the DA to claim a bigger say in irrigation affairs, particularly in the identification and screening of projects, but also in the design and construction phase. In short, it was envisioned to take away irrigation powers from the DIHM and grant them to the DA (WECS, 1982; DHV/APROSC/WB, 1989).

There was particularly strong critique on the inefficient duplication of so-called 'development boards' for each big irrigation project (WECS, 1982). Development boards, formalized through the Development Board Act of 1956 (Pradhan and Yoder, 1990), were put in place for the efficient implementation of big infrastructure projects. They directly fell under the secretary of the MOWR, and they operated outside the regular structure of the line agency, the DIHM. This allowed development boards, as was the objective, to bypass bureaucratic red tape. The boards also allowed engineers to circumvent the civil service pay structure and rules for promotion. In addition, the construction work under the boards entitled engineers to 'project allowances' and through the work with contractors, the boards offered opportunities for engineers to engage in practices of rent seeking. Not surprisingly, the irrigation development boards were a popular place for employment, and they were almost exclusively stocked with DIHM engineers, while agriculturalists were kept out of it (ADB/APROSC, 1990). In the new policy perspective, the development boards had to be abandoned although that would often take more than a decade (DHV/APROSC/WB, 1989; Khanal, 2003).

And this was not the only issue that changed the operational behaviour of the department. In 1984, the WECS still had the position to discard a proposal of the APROSC, a public research organization that mainly employed agricultural professionals, to set up a 'water management group' (WECS, 1984b). The main problem was, both for the DIHM engineers and for the Canadian consultants working with the DIHM, that the MOWR was not proposed as the executing agency for this group. However, in the end, the DIHM could not resist the pressure for more attention on 'water management issues', and in 1985, it found itself embarking on the earlier mentioned USAID supported 'Irrigation Management Project' (IMP). This project resulted eventually in the adoption of users' participation policies in 1988, and a programme of IMT in the 1990s (Sharma, 2004). The focus also shifted to the rehabilitation and expansion of so called FMIS irrigation schemes (IIMI/WECS, 1987), and to groundwater development (IIMI/WECS, 1987: Gautam, 1989; Sharma, 2004). This move from 'hardware' to 'software' went accompanied with drastic budget cuts, quite literally, disempowering the Irrigation Engineer. Since 1985, with a peak of more than 46 US million for that year, annual irrigation expenditure by the state has been reduced dramatically. The COP of the Irrigation Organization in Nepal has (still) not recovered from this episode. Currently, the annual irrigation budgets are between 10% and 25% of the budgets available in the early 1980s (see Chapter 2). It is only recently, in the post-2000 period, that mega water projects have re-emerged on the international and national water resources development agenda in Nepal (Dhungel and Pun, 2009; DOI, 2011).

3.4.3 The consolidation of water powers in the DOI (1990s onwards)

In spite of more calls for the integration of social and agricultural knowledge in irrigation development in the 1980s, and drastic budget cuts for infrastructure development in the 1990s, the DIHM engineers acted coherently and managed to stay in control of irrigation powers. They were capitalizing on opportunities to strengthen the image of the department as the lead agency in national irrigation development. In 1987-88, in another bureaucratic reshuffle, all 'irrigation components' of the DA (the FIWUD) and the MPLD came to fall under the 'Department of Irrigation', as the DIHM is known since then (Sharma, 2004: DOI, 2008). Then in 1989, following the basic needs programme of the government, the DOI was mandated to expand its organisational structure (and offices) to the district level. Before that time, the department had basically operated as a project agency, hiring most personnel for 4 to 5 years on project basis (WECS/BCESC, 1996). The merger of irrigation tasks and the expansion of the department into a recognized line agency of the government, was an objective that engineers had long aspired for (MOWR, 1981). This allowed the DOI, through the MOWR and the WECS, to pursue its claim as *the national lead agency for water resources development in the regional context*. In contrast, the DA had already 'District Agricultural Development Offices' since the 1960s (Chapagain, 1972).

Another opportunity for DOI engineers was the establishment of the 'National Water Resources Development Council' (NWRDC) in 1993. The council was to have representatives of all political parties and was set up with Canadian assistance with the objective to produce 'national consensus in Water Resources Development [for] protecting national interests [vis-à-vis India] while conducting (...) projects of regional scope' (WECS, 1994: 11). The WECS became its secretariat, putting the (regional) water agenda of NWRDC under supervision of DOI engineers (WECS, 1994). This council created for the DOI a second and more direct line of access to the prime minister and the highest planning bodies in the country. Most departments and ministries that claim a say in water resources development in

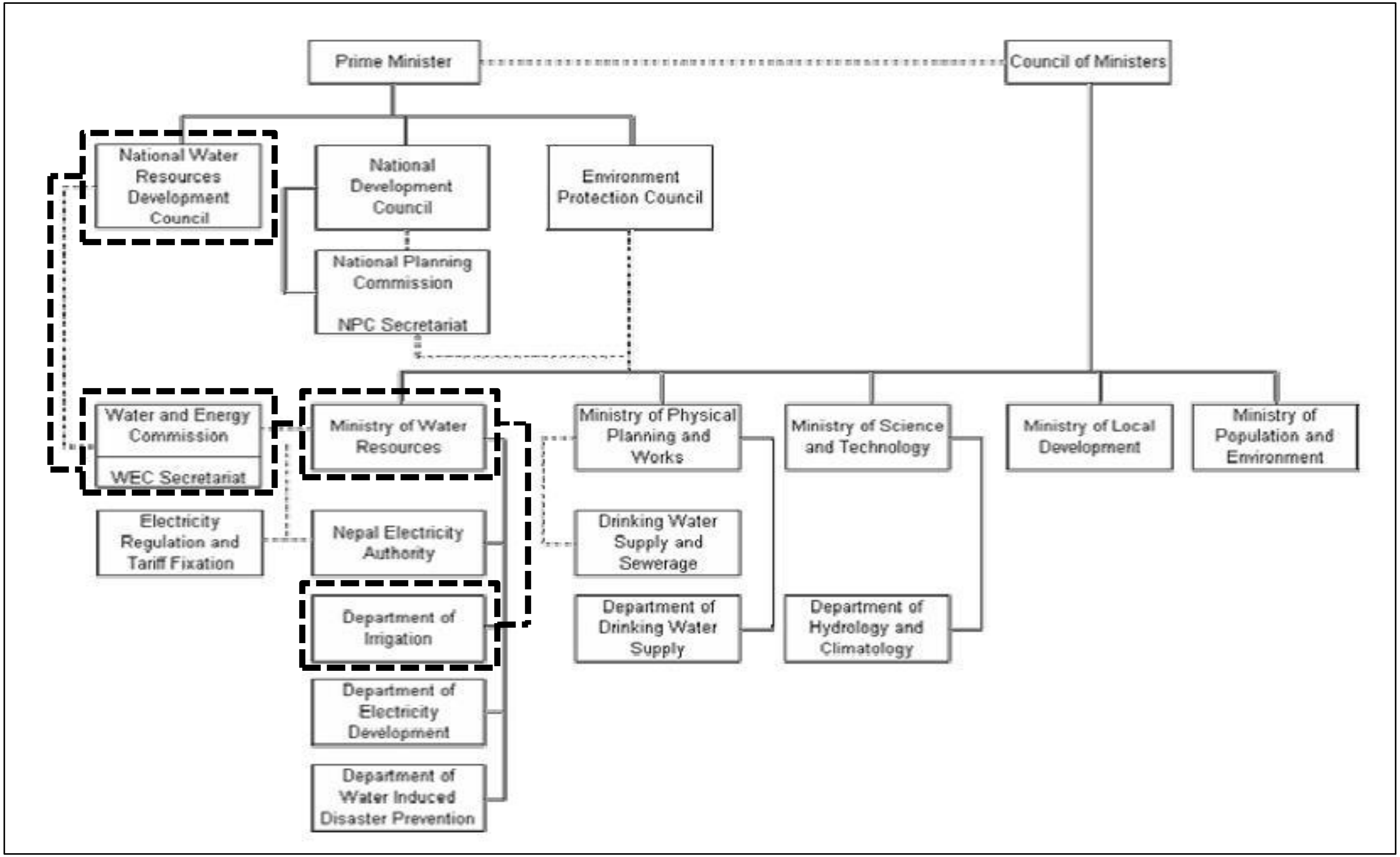
Nepal have access to the prime minister and the NPC only or mainly through 'their' minister. In contrast, the DOI now had an alternative, through the WECS and the NWRDC (see Figure 3.10 for this line of access). The complete absence of the DA in Figure 3.10 also pointedly illustrates that members in the COP of the Irrigation Organisation have been successful in their quest to eliminate in Nepal the claim of agricultural professionals for irrigation powers.

In addition, the first Water Resources Act was promulgated in 1992; the Agricultural Perspective Plan of 1995 re-conceptualized 'year round irrigation' as a major input for agricultural development for the next 20 years – the goal that fields are irrigation for two seasons per year (Sharma, 2004); and in 1996, the government started the formulation of a 'National Water Resources Strategy' through the WECS with support of the WB and CIDA (GON, 2002). This document re-articulated water resources development as a priority policy strategy for turning 'abundance' of water into 'basic needs' living standards, marking a revitalization of the hydraulic mission, i.e. increased government control of water resources for human uses *throughout* the country and ideally through big projects (Dhungel and Pun, 2009). In this context, with DOI engineers at the forefront, regional negotiations between Nepal and India gained new impetus through a newly initiated 'Nepal-India Joint Committee on Water Resources' (GON, 2000). As per January 2013, this committee had 7 meetings with the purpose to solve trans-boundary water issues, mostly in relation to the Kosi and Gandaki agreements but also to arrive at new projects for water and hydropower sharing.[23]

In this background, the DOI has grown into a robust organization and has strengthened its position as the lead agency in water resources development in Nepal. Figure 3.11 presents an organization chart of the DOI as it exists today. It illustrates that the DOI is organized into a central level administrative section, four thematic divisions (planning and design, surface irrigation, groundwater irrigation and irrigation management), and five regional divisions (Eastern, Central, Western, Mid-Western and Far-Western). Autonomous development boards as they existed in the 1970s and 80s, can be considered to have found continuation in so-called 'central level irrigation projects', now directly supervised by the director general of the DOI (see Figure 3.11). These are often big, high-profile, donor-funded irrigation programmes, which have a separate country office for administration. For instance, the ADB-funded 'Community Managed Irrigation and Agricultural Sector Project (CMIASP, 2005-2012) had its country office located at the premises of the headquarters of the DOI in Kathmandu. The organizational structure of the DOI falls hierarchically under the MOWR and the WECS, and senior engineers of the DOI who have completed their career in the agency move to the ministry buildings of Singa Durbar.

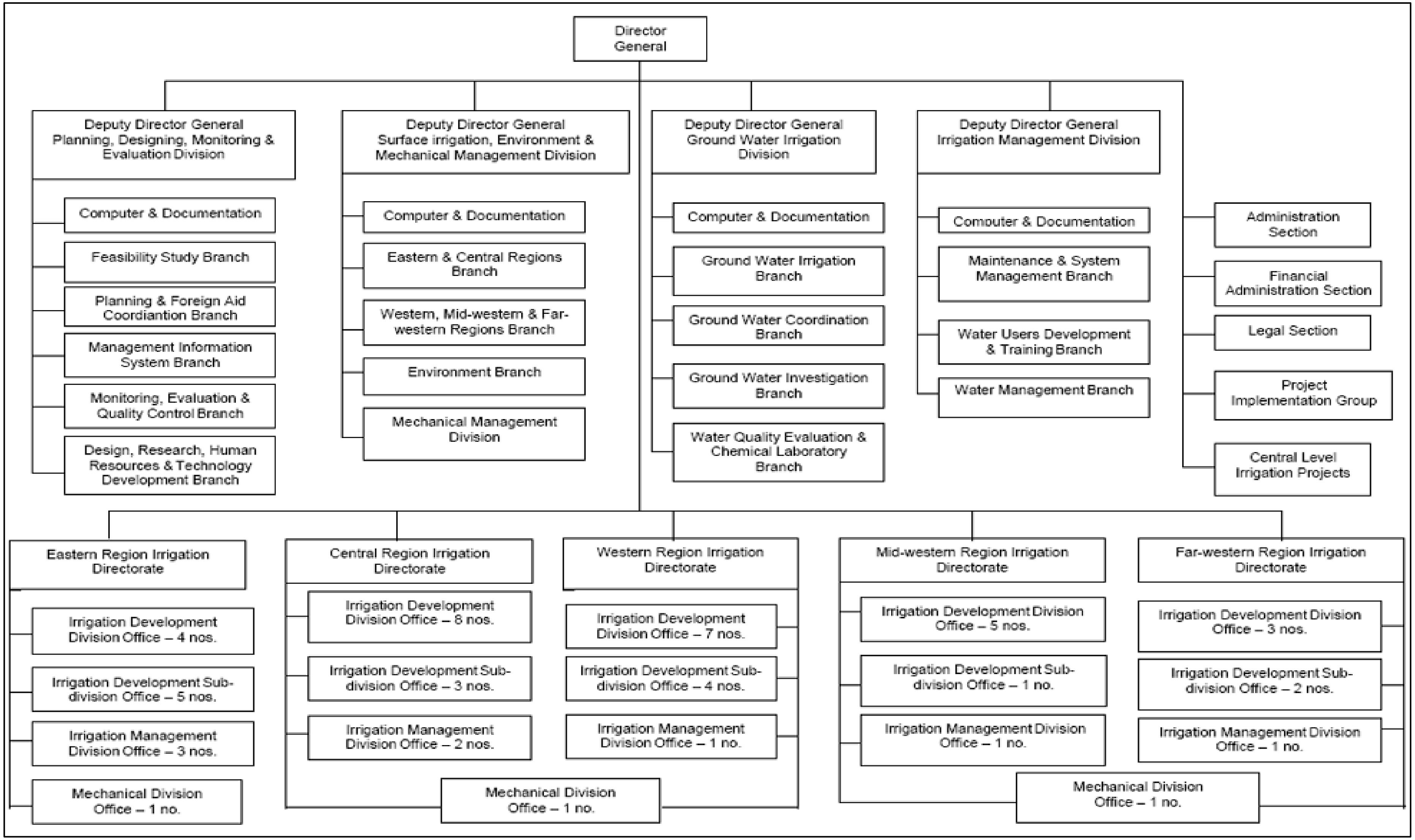
[23] This information on the number of meetings is taken from www.ekantipur.com in an article on the 'Nepal-India Joint Committee on Water Resources' (January 17, 2013). Visited on 21 May 2013.

Figure 3.10: Water resources development agencies at central level



Source: WECS, 2004

Figure 3.11: Organizational chart of the DOI



Source: www.doi.gov.np (visited 21 May 2013)

In response to the Local Decentralization Act of 1999, meant to distribute central powers across the public administration to lower levels of government, the DOI saw it opportune to reform its structure from 75 district offices into 42 divisional offices (Khanal, 2003; Udas, 2011). Under this act, local authorities like the 'District Development Committee' (DDC) and 'Village Development Committee' (VDC) were empowered to control natural resources within their boundary, and thus also empowered to select irrigation projects at the district level. The DOI engineers, and central level administrators in general, were reluctant to give up this privilege, and the DOI adopted a structure of 'divisional' offices, thus disassociating district-level irrigation projects from district-level control, at least for the initial and critical phase of project selection. This reorganization also offered an opportunity to reduce (operational) personnel in government-managed irrigation systems (Khanal, 2003).

Furthermore, there are a few more water related agencies that are controlled (de facto) by the DOI. The first is the 'Groundwater Resources Development Board' (GWRDB). This organization has its origin as a technical unit in 1967 under the then DIDW, and was established as a development board in 1976 under the MOWR. The agency has grown – it currently has nine branch offices in the Terai – but it never achieved an autonomous status, and it has remained institutionalized under the MOWR, and thus under control of DOI engineers (see Gautam, 2006 for background). Another agency is the 'Department of Water Induced Disaster Prevention' (DWIDP), established in 2000. This agency grew out of the 'Water Induced Disaster Prevention Technical Centre' that had been initiated in 1991 under assistance of the Japan International Cooperation Agency (JICA).[24] It came to include the work that the DOI did on river training and flood control. In the first decade of the department, the DWIDP was basically run as a satellite department of the DOI. Its staff requirements were fulfilled by transferring engineers of the DOI back and forth to the DWIDP for periods of 2 or 3 years. This meant that engineers working for the DWIDP remained loyal to the DOI, because they had to pursue their career in that organization in due time.[25]

Then, in 2009, after nearly 30 years, the MOWR was suddenly split into the 'Ministry of Irrigation' and the 'Ministry of Energy' (Udas, 2011). Protests of engineers followed, as one retired engineer and member of NWP/JVC explained to me in October 2009, because the integrated development of Nepal's water resources now lacked a 'home ministry', but the protests came too late. In a situation typical for Nepal, in negotiations on the division of minister posts in the new cabinet between the Nepali Congress (NC) and the United Marxist Leninist (UML), the ministry had fallen prey to partisan politics, and had been split to create two minister posts without any consultation of the administrators (Himayalan, 2009). As per May 2013, this situation continued to exist, even though the ministries were housed in the

[24] See: www.moir.gov.np, visited 21 May 2013.

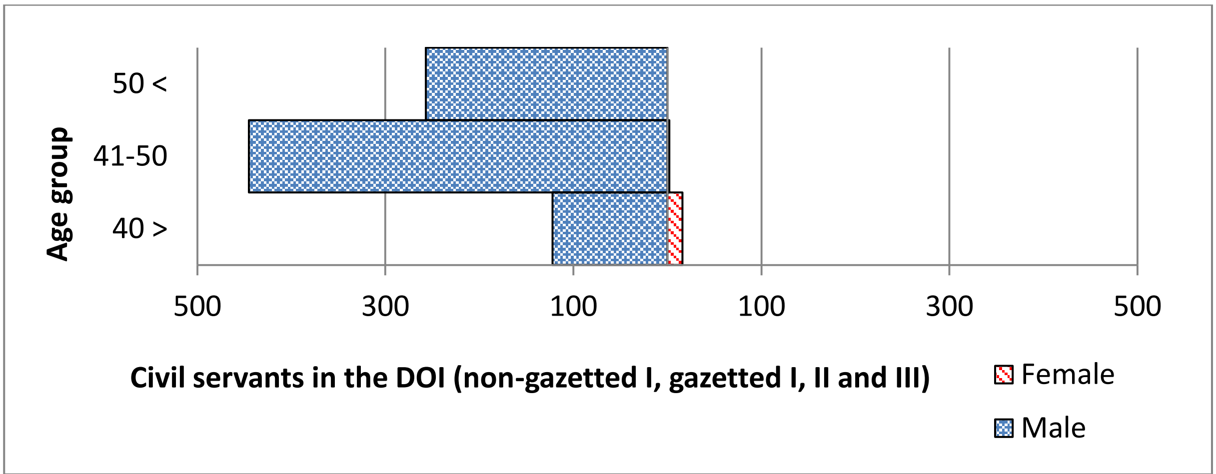
[25] Personnel communication with various DOI engineers and foreign expats in the period 2009-2011.

same building in Singa Durbar, and one minister was heading both ministries after a new cabinet formation, acting de facto as the minister of water resources.[26] In spite of these recent developments, the DOI has become a mature agency with a clear professional identity that is strongly linked to the (civil) engineering profession. In that sense, the DOI has all the characteristics of an Asian irrigation department (Saciwaters, 2011; Ongsakul *et al*., 2012).

3.4.4 Who has access to employment and career advancement in the DOI?

In 2011, according to the Chief Administrative Officer of the DOI, the department employed 1.862 people of which 1.237 were considered core staff (gazetted and non-gazetted first class) and 625 support staff. This makes the DOI, like the civil service in Nepal in general, a small organization compared to other national water agencies in South Asia. For instance, the Bangladesh Water Development Board had more than 5.000 employees in 2008. The age and gender pyramid of the DOI (see Figure 3.12), based on figures of 2008 when the DOI had 842 core staff rather than 1.237 (DOI, 2008), resembles the age and gender pyramid of the civil service in Nepal (see Chapter 2). It shows that the DOI almost exclusively employed male engineers, and that the average DOI officer was slightly older (between 45 and 50 years old) than the average officer in the civil service (43 years old). It is unknown to me when the first female engineer entered the DOI, but in 2011, there were just 20 female officers among the core staff at the DOI, about 1,5%, reflecting the overall masculinity of the civil engineering service in Nepal (3% female employees in the engineering service). These numbers make DOI one of the most male-dominated water agencies in South Asia (SaciWaters, 2011).

Figure 3.12: Age and gender group pyramid of core staff in the DOI



Source: DOI, 2008; Chief Administrative Officer of the DOI, August 2011. See Annex 21.

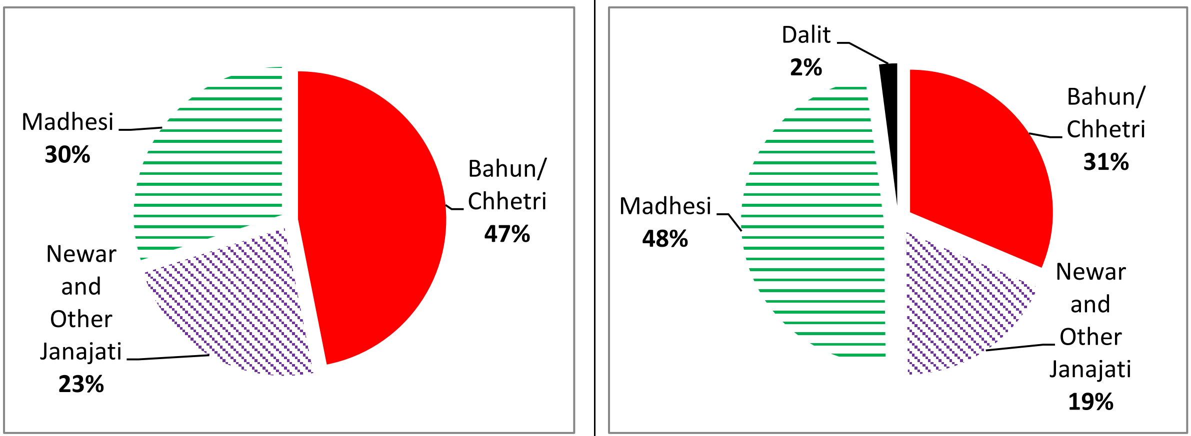
An analysis of the caste and ethnic background of the DOI staff reflects the domination of B/C castes and Newar people in the civil service of Nepal (see Figure 3.13). Also the DOI, as the civil service in general, can thus be considered to function as a closed class and caste

[26] See: www.moir.gov.np and www.moen.gov.np, visited 21 May 2013.

organization of members in the COP of the National Elite (cf. Gellner *et al*., 2008 [1997]). As noted earlier, an exception is the Madhesi people, a group that is nowadays considered an ethnic Terai minority in Nepal (DFID/WB, 2006). In the DOI, the Madhesi are an important group both at low and high management levels in the agency.

Figure 3.13: Caste and ethnicity of DOI staff at higher and lower management levels

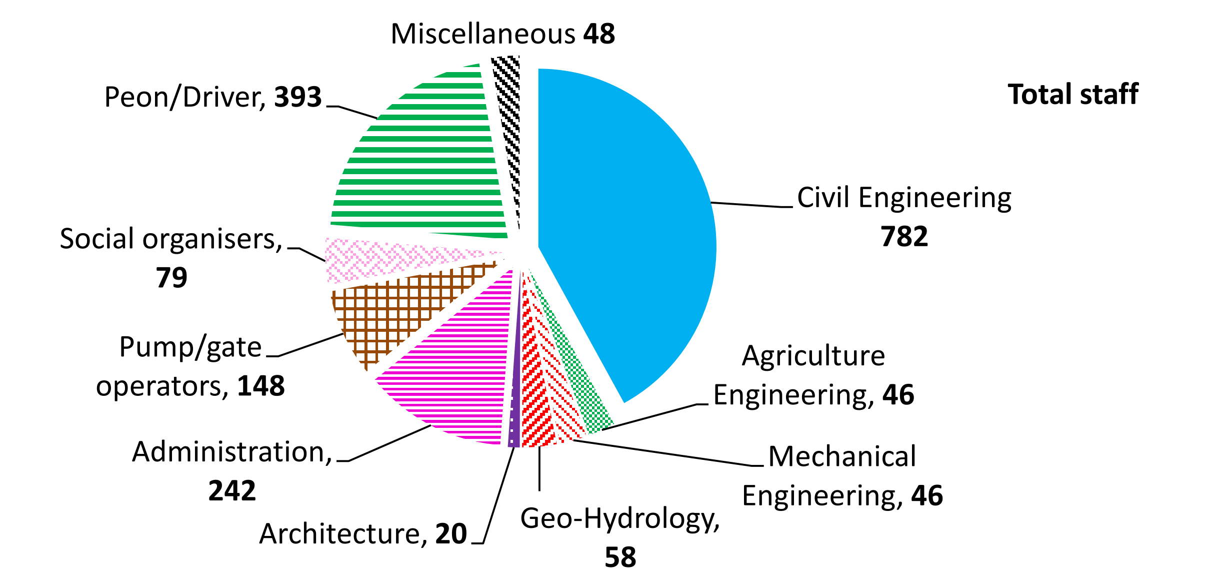
Higher management level (Third, second and first class gazetted)	**Lower management level** (First class non-gazetted)

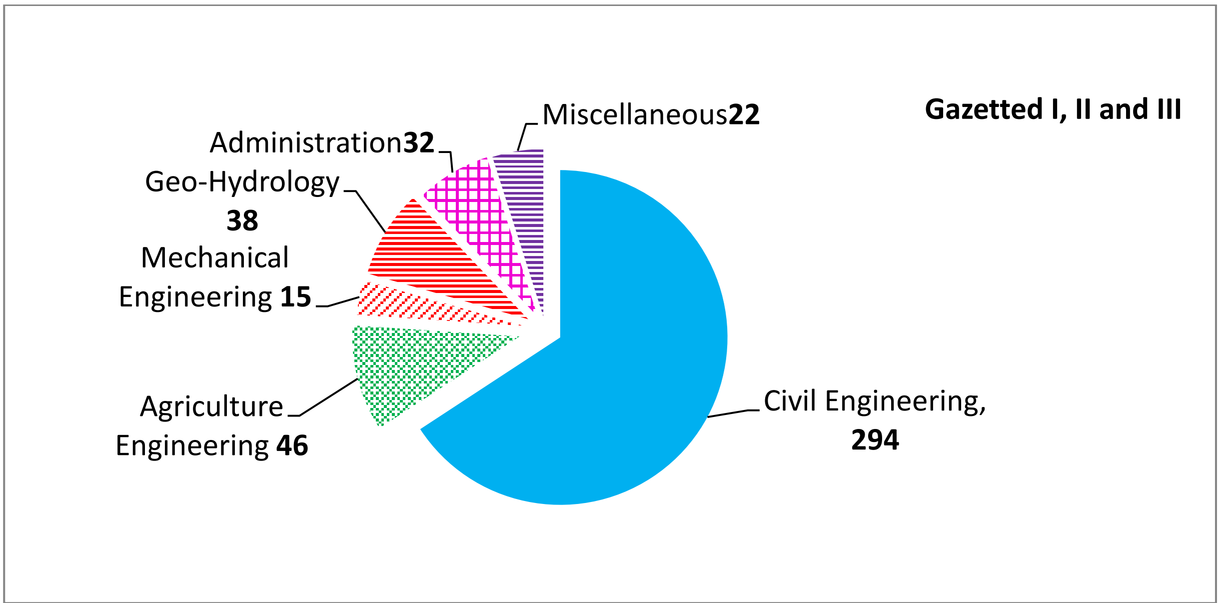


Source: DOI, 2008. See Annex 21.

The recruitment, transfer and promotion of (core) staff of the DOI is administered by the PSC (see Chapter 2) and senior officials in the DOI, based on a complex system of rules, examinations and performance evaluations (Shrestha, 2001; Udas and Zwarteveen, 2010). The recruitment of staff is proposed by senior engineers in the DOI who decide on the number and type of staff that is required for the organization, and they forward requests to the PSC, the Ministry of Finance, the Ministry of General Administration, and the NPC. The Chief Administrative Officer in the DOI explained to me in August 2011 that the DOI continues to ask for – and thus recruits – mostly civil engineers. This is reflected in the total staff composition of the DOI (see Figure 3.14), which shows that civil engineers are the dominant group in the DOI. The staff composition is even more biased in favour of civil engineers at higher management levels – 66% of the gazetted positions were occupied by civil engineers and only 12% of higher postings were filled by officers other than engineers. These numbers clearly reflect that the DOI is an engineering organization.

Figure 3.14: Number of personnel in the DOI per discipline or job



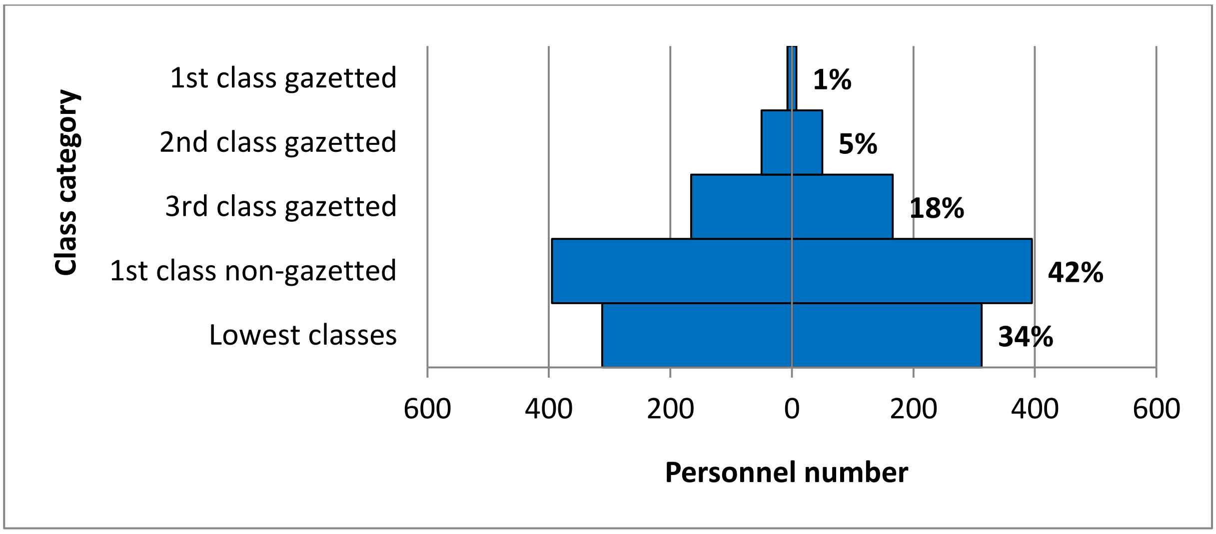


Source: Chief Administrative Officer of the DOI, August 2011. See Annex 21.

The age pyramid of the DOI (see Figure 3.12) illustrates that hardly any new (permanent) staff has been recruited during the last two decades. In 1988, the DOI had 1.993 employees compared to 1.862 in 2011 (DHV/APROSC/WB, 1989). The often temporarily vacant positions in the DOI have little to do with this. For instance, in 2008, there were 138 out of 980 staff positions reported as unoccupied (DOI, 2008). There often is the need to create space in the organizational structure of the civil service to promote a whole batch of officers in the same age and class category. The issue of unoccupied positions in the DOI was resolved in this way in 2011 when a batch of non-gazetted first class officers was promoted to gazetted first class positions after nearly 20 years of service (personal communication Chief Administrative Officer of the DOI, August 2011).

Job assignments, transfers and promotions in the DOI are centrally controlled by senior officers through individual performance evaluations. Generally, these issues are a source of frustration among civil servants, also for DOI staff, because career opportunities are scarce, particularly for mid-level technicians like overseers (ERA, 1973; see also Chapter 2). First, seniority is the overriding consideration for promotion at the expense of merit. The frustration among staff is particularly related to the practice of strictly maintaining the hierarchical class structure of gazetted, non-gazetted and classless positions in the civil service. The hierarchical class structure of the DOI is presented in Figure 3.15. When comparing this pyramid with the age pyramid of DOI presented above (Figure 3.12), it follows that many (senior) officers have to wait for their promotion for many years (see also the case described above).

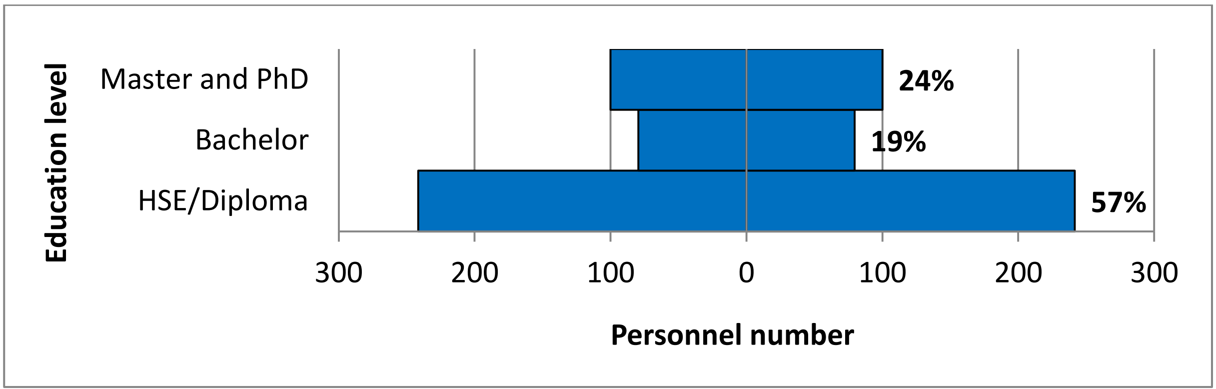
Figure 3.15: Organizational structure of the DOI based on total staff



Source: Chief Administrative Officer of the DOI, August 2011. See Annex 21.

A second source of frustration is that most DOI engineers are over-educated for the work they do. This situation was particularly apparent for the DOI compared to the civil service in general. Among the core staff of the DOI, no less than 24% of the officers had completed a master or even PhD degree education (see Figure 3.16), compared to just 7% of the officers in the civil service. Yet, only 9% of the DOI core staff had a posting that fitted their education level (gazetted second or first class positions). On paper, a completed master degree and other professional training related to irrigation engineering and water resources management, provide for additional points in performance evaluations and promotion decisions, but in practice, it mainly has been seniority that counted because many DOI engineers have completed higher degree education (often during service).

Figure 3.16: Education level of the core staff of the DOI

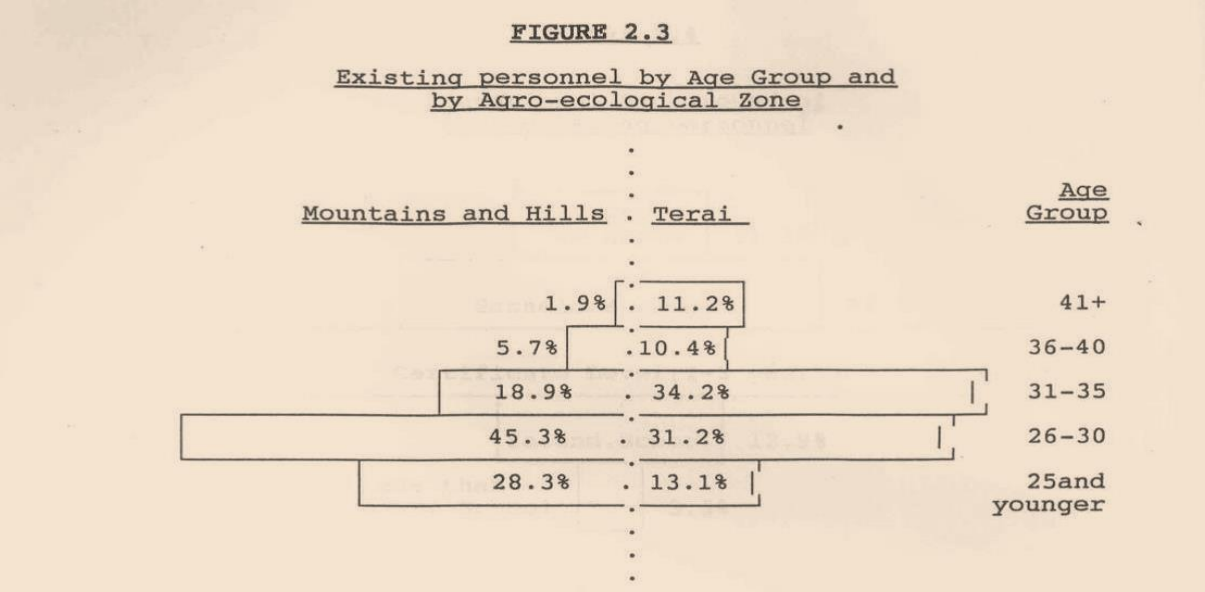


Source: DOI, 2008. **Note:** HSE = Higher Secondary Education. See Annex 21.

A third source of frustration is related to the construction-work-based performance evaluations, and the limited opportunities that exist for staff to get involved in on-going and big construction work. At most of the divisional offices of the DOI, no other activities take place than regular maintenance and rehabilitation work, particularly in remote areas. In the DOI, work performance is evaluated on the basis of marks granted by the supervisor, the reviewer and a review committee, with the direct supervisor having the most power and influence. Aside from points for educational qualification and trainings, and higher marks for service in a remote area due to hardship, the performance evaluation is mainly about monitoring the actual completion of targeted activities in a certain period. Four criteria in particular are important: (1) the quantity of the work performed (planned versus achieved), (2) the amount of money spent (planned budget versus expenditure), (3) the time spent (time planned versus time spent), and (4) the quality of the work performed (functioning of the system, sometimes related to water fee collection among farmers)' (Udas and Zwarteveen, 2010: see p.91). Because there exist limited opportunities to get involved in (big) construction work, there are also very few chances to show 'your' work to your direct supervisor and secure a merit-based transfer or promotion.

This was particularly a concern for staff stationed at divisional offices that were located in the Hills and the Mountains. Big construction projects (with big budgets) are mainly located in the Terai, and are often part of central level irrigation projects. To get involved into these projects, it is thus pertinent to secure a posting in the Terai at a divisional office or in Kathmandu at the central offices. Preference to be posted or transferred – two years is the minimum for a post according to civil service rules – to an office in the Terai or Kathmandu have always existed in the DOI, just as the differences in preferences among staff are also known to exist (Newar tend to prefer postings in the Kathmandu Valley and Madhesi generally prefer postings in the Terai). This creates a hierarchy and competitive struggle over scarce postings that is illustrated in Figure 3.17, an age group pyramid of the staff of the DOI in 1989 categorized by the ecological zones of Nepal. It shows that senior officers – here defined as 31 years and older – were mostly posted in the Terai, while junior engineers were left with work at unattractive postings in the Mountains and Hills.

Figure 3.17: Getting posted at attractive positions



Source: DHV/APROSC/WB, 1989: 11 (Figure 2.3)

The argument that big irrigation projects in the Terai are more technically demanding than projects in the Hills, and therefore require more experienced staff, is not necessarily true. Building irrigation structures in the Hills also is a technically demanding job, and the construction of small intakes and canals in the Hills is a skill that most engineers have not learned at the colleges (Indian engineering education almost exclusively focusses on canal construction in alluvial plains). In fact, hill irrigation engineering is a skill that engineers learn through years of work, and this is a reason why many junior engineers do not mind to start their career at a project in the Hills. A Terai project is the preferred option, but a remote posting in the Hills also provides for a learning experience and entitles one to additional marks in the annual performance evaluation, enhancing the opportunities for promotion (WECS/BCESC, 1996). This situation is different for senior officers. They expect and aspire for higher management postings after years of hard work in remote areas. Their aspirations are not just about the opportunities that arise in (big) construction works to supplement income, through project allowances or rent seeking, but more about the desire to show off professional skill and perform as an Irrigation Engineer in charge of big canal irrigation projects. However, as discussed, higher management postings are scarce, and when officers get promoted, particularly when part of a batch, they often end up at similar remote postings, doing the same routine work. In this situation, it is practically impossible to make promotion or get an interesting posting without resorting to informal practices like aphno manche, chakari and source force (see Chapter 2).

In relation to the question of access to employment and career advancement in the DOI, it is important to note that the competition in the DOI over postings is mainly about professional performances and resolves around opportunities to show off as an Irrigation Engineer. This can be illustrated with the following example. A human resources study for the irrigation sector, conducted by Nepalese researchers from APROSC in 1989, mentioned the following categories of professionals by occupation: 'irrigation specific occupations', 'agro-irrigation specific occupations' and 'related technician occupations' (DHV/APROSC/WB, 1989: 6). These occupational categories have never existed as formal service or class categories in the civil service or in the private sector, but they were nevertheless *perceived to exist* by the DOI officials and irrigation consultants who were interviewed for the study. These categories reflected (and continue to reflect) the informal professional divisions that prevail in the DOI and in the irrigation sector at large. It marks the professional hierarchy and the regulation of membership in the COP of the Irrigation Organization. Engineers and water professionals who focus on irrigation hardware stand on the top and are considered full members in the COP of the Irrigation Organization (identified as irrigation specific occupations). In contrast, engineers and professionals who focus on agriculture and irrigation management (identified as agro-irrigation specific occupations) or work on statistical, social and economic issues in irrigation (identified as the related technician occupations) stand at the bottom and tend not to be considered a (real) member in the COP of the Irrigation Organization. Higher management posts in the DOI squarely qualify for irrigation specific occupations, and provide thus for an opportunity to maintain the hierarchy of professionalism attached to engineering. At this level, acting as an Irrigation Engineer has strong masculine connotations.

The narrow relation between struggles in the DOI over postings, professionalism *and* masculinities is also evident in the concerns of DOI officers about foreign consultants being too much involved in Nepalese water planning and irrigation projects. This is an issue of Nepalese nationality, and touches directly on the practice of the Irrigation Engineer and the performance of Elite Manhood. For instance, in a human resources report of WECS, written in 1984, it is stated that '[t]he Ministry of Water Resources (...) wishes to *maximize indigenous participation in all fields at all levels in its works and programmes*', because '*only Nepalis can truly prescribe what is right for Nepal'* (emphasis added) (WECS, 1984: 1 and 7). Saliently, this WECS report was written by a Canadian consultant, but it clearly describes the concerns of DOI engineers (and Canadian consultants) in relation to the dominant presence of foreigners in the water sector of Nepal. Illustratively, in 1984, the Canadian supported WECS had 15 vacant positions (WECS, 1984). As mentioned earlier, the WECS was initially perceived by DOI engineers as a threat to their authority, or in other words, the WECS was essentially considered too Canadian by engineers and 'their' plans too foreign, and this conflicted with the status and popular image of the Irrigation Engineer and the performance of Elite Manhood. Apparently, these concerns outweighed the opportunity for professional training by the Canadians even though the availability of trainings and professional courses for DOI staff was limited (WECS, 1984; 1994), then and now.

The connection between professionalism, nationalism and masculinities in the DOI in relation to a culture of engineering runs deep. The same human resources report of WECS also bluntly stated the claim that the presence of foreigners in the water sector 'continues to flourish due to local limitations [of engineers]' (WECS, 1984: 3). By that time, the acute shortages of engineers and professionals in the 1950s and 60s had already been resolved, meaning that limitations referred primarily to an internationally perceived lack of professional capacities of Nepalese water planners and engineers vis-à-vis foreign water experts. One way how Nepalese irrigation engineers have traditionally dealt with this, has been to stay in control of the construction work of irrigation systems, and leave the perceived secondary tasks in irrigation to foreigners. Illustratively, the WECS report noted that 'construction fares considerably better [than planning and design] for two main reasons: higher pay through project allowances *and a feeling that one engaged in construction is associated with more interesting, dynamic and challenging work*' (emphasis added) (WECS, 1984: 7).

These examples illustrate some of the connections and associations that exist in the DOI between professionalism, nationalism and masculinities, and a culture of civil engineering. They explain why the DOI has remained such an inaccessible and resilient (male) engineering organization despite a dramatic shift in (policy) focus – from the construction of big surface irrigation systems in the Terai to divers goals such as the rehabilitation of FMIS, PIM, command area development (CAD) and groundwater development. It also explains, for example, why social organisers in irrigation – considered critical to make participation work (DHV/APROSC/WB, 1989) – were merely allocated non-gazetted class positions, and why gazetted first class positions in the department are available only for civil and agricultural engineers (Udas and Zwarteveen, 2010). Changing the engineering culture of the DOI, and opening the doors for sociologists, economists and 'other' professionals, will invariably challenge hierarchies of professionalism in the DOI and also compromise the practice of the Irrigation Engineer in the COP of the Irrigation Organization.

3.5 Conclusions

This chapter has presented a first analysis of how masculinities in irrigation governance in Nepal are sustained through the inclusion and disciplining of young professionals in the COP of the Irrigation Organisation. A historical analysis and feminist reading of the main roadway for becoming an Irrigation Engineer in Nepal has shown that the institutions on this roadway have functioned in a dual role – as key sites for learning about engineering professionalism and as principal breeding grounds for performances of Elite Manhood in Nepal. Participation in these 'public' institutions – and acquiring membership through it in an (international) professional COP like the Irrigation Organisation – is recognized as a roadway for Nepalese elite men (and some women) to become a full member in the COP of the National Elite. In short, becoming an Irrigation Engineer in Nepal has functioned as a roadway in the family-society sphere in Nepal to learn about performing up to the norm of Elite Manhood and become a man of standing in the COP of the National Elite.

The concept of roadways holds that all roadways for becoming a professional are diversely gendered – as illustrated by the (main) roadway for becoming an Irrigation Engineer. The question is not if professionalism intersects with masculinities and femininities, but how and in what context. The performance of the international water expert is thus also gendered and arguably, even 'more' masculine than that of the Irrigation Engineer. I repeat this point because researchers, mainly from the West it appears, have been quick in pointing their finger at the masculinities of civil engineers in the national irrigation agencies. Since the 1980s, they have been held accountable for engineering biases in irrigation and the construction of 'their' professional culture as masculine is considered (most) problematic – a view that also underlies this thesis (Lynch, 1993). This view insufficiently acknowledges the political reality in Nepal that global organizations like the WB and the ADB have played a key role in the financing of irrigation development and it also ignores the perspective of irrigation engineers themselves (see Chapter 4). Taking these reflections into account, I reiterate the suggestion that it is useful – as I have done in this chapter – to talk about the COP of the Irrigation Organisation rather than about particular institutions, organisations or professions.

That having been said, the institutions on the roadway for becoming an Irrigation Engineer can be considered to have very strong masculine associations – to the point that irrigation professionalism in Nepal and masculinities seem inseparably to define each other. Historically, the institutions have been structured by a select group of male members in the COP of the National Elite. Women and 'other' men from various backgrounds have been (and are) almost completely absent in the development of these organisations, even though none of these institutions has an official history of discrimination against women as in the West (Nair, 2012). Illustratively, the building up of engineering education in Nepal continues to be discussed in terms of expanding 'manpower' (IOE, 2005; INPIM/N talk programme, 22-10-2010). In a feminist reading of history, the more than 50-fold increase of intake capacity of students at engineering colleges in the last six decades can thus be considered to constitute an effort of the male elite to carve out a domain for the performance of Elite manhood, and when seen as a project of hegemonic masculinity, it is merit-based selection for education – not quotas, scholarships and other affirmative action policies for women and disadvantaged groups – that produces unfairness across boundaries in family-society and professional spheres. This puts in a critical perspective that engineers are generally proponents of merit-based selection in engineering (see for this discussion in India: Parikh and Suthatme, 2004).

The set-up of regulatory organizations for the engineering sector in Nepal, initiated internationally (CTEVT under the Colombo Plan) or nationally (NEC by the NEA), and the many professional associations in the country, regulated by elaborate rules for membership, also emerge in the analysis as carefully constructed projects of professionalism *and* masculinities. The engineering associations provide for textbook examples how the identity of (irrigation) engineering informs and governs both family-society and professional spheres in Nepal. The existence of NEWS is a nice example, an organisation in which the status of engineers' wives provides for an identity to get involved in charity activities.

The negotiations and hard work of DOI engineers, over sixty years, to acquire a guardian agency for 'their' hydraulic mission and a home ministry for water resources development, illustrate how state organisations have been shaped through competition (and cooperation) among groups of elite men in the COP of the National Elite, notably between irrigation engineers and agricultural specialists, seeking to carve out a space for themselves for an honourable performance of Elite Manhood. It can be seen that the shaping of the DOI into an irrigation 'lead agency' in Nepal has been used as a platform for this and vice versa: male members in the COP of the National Elite and 'their' masculinities have been shaped according to the needs of the state, bringing about changes in the family-society and the professional spheres (cf. Tamang, 2000). Any resilience of an engineering culture in the DOI needs thus to be conceptualized in the way how the COP of the National Elite in relation to the state is structured and how high-class, upper-caste masculinities and femininities in Nepal are performed – not just in terms of the (gender) politics within the agency.

In such an analysis it is critical to identify the connections with the global politics of institutions and see masculinities as an intercultural phenomenon. The engineering education system and the organisation of the DOI carry the Indian imprint of British colonial education and irrigation development, and both institutions have been built up with assistance of donor and aid organisations from across the world. Likewise, the professional associations in Nepal are part of regional and global alumni networks, and most of the engineering associations have been conceived in the image of 'their' western counterparts, functioning as member organisations of global professional federations. Both in the West and in Nepal, these institutions carry the imprint of the development of separate gendered spheres of the feminine domestic realm of the private and masculine realm of the public.

The analysis has shown that the gendered exclusivity of the institutions on the main roadway for becoming an Irrigation Engineer is dynamic, mutable and contested. Meanings of masculinity in the construction of the institutions have taken different shapes on the way – of which only some have been revealed in this chapter. Further research is desirable on this topic and for this, I share three last observations.

Western engineers and professionals on mission in Nepal can be considered to attach a different meaning to engineering than their Nepalese counterparts. It is true that the concept of engineering was introduced in South Asia by colonial powers as a product of the mutual shaping of technology and society in the West (Gilmartin, 1994; Iyer, 2013), but historically, in Britain, there was a higher appreciation for liberal arts compared to engineering sciences as the latter was associated with craftsmanship and merit rather than status and lineage. For the US, Oldenziel (1999) has shown that technology was made masculine (and white for that matter) during the late 19th century in the efforts of middle-class men to gain status and respect as civil and mechanical engineers. Historically, engineers in the West have thus been at the lower end of the 'white' hierarchy (Zwarteveen, 2011), reserved for the middle-classes that were seeking upward mobility and opted for promising employment prospects. In contrast, in Nepal, engineering obtained a meaning in the 1950s and 60s in terms of being associated with national progress and state planning, and the profession mainly attracted male members of high-class, upper-caste elites who associated 'engineering' with universal practice and foreign cooperation in professional COPs like that of the Irrigation Organisation.

The position of Madhesi in engineering also needs mentioning here. Historically, they have not been part of the COP of the National Elite except for a few members (Regmi, 1999 [1972]; 1999 [1977]). Nepalese tends not to be their mother tongue and this has affected their employment opportunities in the Kathmandu-based civil service and aid industry. Engineering is the notable exception, including the engineering service in the public administration. In fact, it appears that employment in engineering, with the start of bikas in the 1950s, has been recognized by Madhesi as a roadway to claim and establish membership in the COP of the National Elite – much like middle-class men in America sought to fit themselves into an emerging industrial-urban system between 1893 and 1920 by laying claim to the engineering profession (Frehill, 2004). Various explanations can be given why Madhesi in particular, saw an opportunity to lay claim to the engineering profession. They are said to have had better exposure to engineering projects in India (roads, railways, bridges and irrigation canals) and this is believed to have given them a head start in the 1950s and 60s. They also supposedly had good access to engineering colleges in India, speaking Hindi and having family members in India. Others point out that most engineering works were planned in the Terai and also that engineering did not require writing skills in Nepalese language which was (and is) necessary for postings in the Kathmandu administration. Yet, others explain the presence of Madhesi in engineering by saying that the Madhesi have a much stricter dowry system than the B/C castes in the Hills, comparable to regions in India, and that an engineering degree makes a boy a much wanted marriage candidate. It is not difficult to see that this argument in particular, can explain why (Madhesi) engineers have constructed the irrigation engineering profession in Nepal as a particularly masculine one.

A last observation is that the popular appeal for boys and men to become an engineer has been remarkably resilient in the region, but also that there is now evidence across South Asia that this popularity is declining (Parikh and Sukhatme, 1994; 2004 Parikh *et al*., 2003; Gupta, 2007; Nair, 2012). In India, civil engineering – the mother discipline of engineering in South Asia – is no longer the most popular discipline among (male) engineering students, and in Kerala, civil engineering now counts on a near equal enrolment of girl and boy students at engineering colleges (Nair, 2012). Likewise, though not as dramatic as in India, an increase of female students has been recorded at the Bangladesh University of Engineering and Technology (BUET) from 14% to 20% between 1991-2001 (SaciWaters, 2011). The gendered image of engineering has particularly been challenged by software engineering disciplines in India where women outnumber men in states like Kerala and urban centres (Nair, 2012). This trend is also visible in Nepal. Civil engineering is (still) the most popular discipline among (male) engineering students, but electronics and computer engineering gain popularity, and girl enrolment for civil engineering has been rising steadily from 10% to 15% between 2000-2010. In short, it appears that the Irrigation Engineer no longer exemplifies a form of hyper-masculinity in the genderscape of masculinities and femininities, as it did in the past. This appears to relate and coincide with a decline in status of employment in the civil service, which is no longer considered the most preferred career prospect for young graduates. In the last decade, in Nepal, INGOs and to a lesser extent NGOs, are considered to offer the best pay, more dynamic working environments and the most promising career prospects for both male and female professionals (Karmarcharya *et al*., 2003; Devkota, 2003; Udas, 2011).

Chapter 4:

Becoming a “real” Irrigation Engineer: Pleasures, passion and agency

4.1 Introduction

Building on the previous chapter, this chapter presents a further investigation of the (main) roadway for becoming an Irrigation Engineer – as an example how (young) professionals acquire membership in the COP of the Irrigation Organisation. The observation in Chapter 3 that engineering institutions are contested terrain in regard to professional performance *and* masculinities, suggests that not everybody is entitled to become an Irrigation Engineer. The ability to offer authoritative expert advice is not an opportunity automatically bestowed on any person or group that seeks it, but something that professionals must actively assert, cultivate, and guard – and ‘show’ (Hilgartner, 2000). From masculinity literature, we know that this happens in the face of intense opposition – between elite men, between elite men and non-elite men, and between men and women (Martin, 2001; Whitehead and Barrett, 2001; Frehill, 2004; Connell and Messerschmidt, 2005). In short, getting an engineering degree, and becoming a member of an engineering association and securing employment in the civil service of the DOI, does not automatically make a person an Irrigation Engineer, nor a man (or women) of standing in the respective COP of the National Elite. For this, junior engineers need to participate in the informal milieu of the institutions, develop agency and acquire the desire, skills and perceptions that fit the normative performance of a gender authentic and ‘real’ Irrigation Engineer. To understand how this works and how masculinities in irrigation engineering co-define performances of hegemonic masculinity in society and in the informal milieu, this chapter starts by analysing the intersections that exist in Nepal between family-society and professional spheres. It then seeks to document the development of desire and agency of young engineers in the DOI, which has been conceptualized to occur through two separate yet interrelated processes: self-normalization and transitional performance.

For becoming an Irrigation Engineer – and for performing up to the norm of Elite Manhood – young engineers have to acquire the technical skills for engineering (education, experience) as well as learn about professional desire and pleasures (develop a passion to perform specific irrigation tasks and priorities). In short, they need *to develop agency* for walking, talking and acting like an Irrigation Engineer. Young engineers need to learn about the skill to make jokes about designs, laugh about technical details, associate beauty with trapezoidal canals, tell stories about construction works and act passionate about the sorrows of ‘the people of Nepal’. The capacities or willingness of young engineers to display the ‘right’ professional desire and the ‘appropriate’ pleasures in the informal milieu can be considered as a sign of agency and as an important measure of individual capacity to 'get' included and disciplined in the DOI. Those who aspire for field work and learn to desire tasks in construction work are more likely to perform up to the norm of a 'real' Irrigation Engineer, than those who aspire for architectural design of structures and find pleasure in extension work with farmers.

For young Nepalese engineers, the roadway for becoming an Irrigation Engineer is thus not only regulated through the control of formal engineering institutions (education qualifications, entrance exams, quotas, membership criteria, promotion rules and regulations), but it is also governed by the informal milieu that prevails at these institutions. Here, informal milieu means more than the practices of chakari, aphno manche and source force that have been mentioned earlier (see Chapter 2). For a conceptualization of the informal milieu, I have looked to the work of Gupta (2007). In her study on the informal milieu at two Indian Institutes of Technology (IIT) and the position of women doctoral students in science and engineering, she defines the informal milieu as a process of knowledge production that occurs through 'interactions among peers, and between student and supervisor (...) [as] a system of communication, interaction and exchange' (p.507-508). As a process of knowledge production (discussions, sharing of insights, network building), the informal milieu operates parallel to the technical procedures of coursework, laboratory experiments and dissertation writing, and it is a crucial part of doctoral education at IITs. This concept of informal milieu can *mutatus mutandis* be applied to the engineering institutions in Nepal.

In the view of Gupta (2007), informal interaction is very important for young engineers – 'inexperienced cadets' as they are known in the civil service (Shrestha, 2001) – because it is mainly through these interactions that they can learn about the technical and cultural performance standards of a 'real' Irrigation Engineer. Gupta (2007) posits that the informal environment at engineering (education) institutions is influenced by the social context of different national cultures, and argues that social stereotypes and cultural norms infiltrate these institutions, since they are embedded in the local sociocultural system. Indeed, as documented in the previous chapter, engineering is perceived as a male domain in Nepal (Adhikary, 1995; Udas, 2011) and the informal milieu of engineering institutions in Nepal is infiltrated by cultural norms of masculinity that prevail in the family-society sphere of the COP of the National Elite. This means that the informal milieu is not a level playing field and that male and female engineers face different opportunities to develop desire and agency.

Informal learning, as defined by Gupta (2007), resonates with the idea of social learning in a COP. For clarification, 'learning' in a COP is different from the conventional view, which sees learning as formalized knowledge transmissions or as the cognitive acquisition of knowledge (Lave, 1996). In a COP, learning is defined as social practice, as a process of changing understanding in everyday life and practice. As discussed, the process of learning and 'becoming someone' in a COP is self-normalization or self-disciplining. An act of self-normalization is the copying of behavioural practices of senior officers by junior officers in the DOI in order to perform up to the norm (e.g. wear office dress, behave with authority, make sexist jokes among men). In a COP, the process of developing desire and pleasures for irrigation engineering is thus through daily interaction in the sociocultural environment of the DOI. Such COPs are established, perpetuated and change over time through 'apprentice-master relationships' (Paechter, 2006: 13), taking into account two subject positions: the apprentice, novice or newcomer and the master, experienced member or full participant. Individual apprentices move to full participation and (can) become (full) members in a COP through interaction with 'their' masters and by engaging in acts that qualify for 'legitimate peripheral participation' (Paechter, 2003a), defined here as legitimate and acknowledged activities that contribute to but are not central to the performance of the Irrigation Engineer.

Performing the appropriate identity and displaying a seemingly natural and individual passion associated with that identity is a defining characteristic of membership in a COP. As Paechter (2003a) points out, the formation of a COP is importantly about the negotiation of identity (p.73) and professional COPs function simultaneously as communities of feminine and masculine practice. This implies that opportunities for young engineers to engage in legitimate peripheral participation are gendered – not just between men and women but also among men and among women as not all men and women are comfortable with norms of hegemonic masculinity. What is seen as legitimate is importantly defined by multiple membership in COPs. Male and female engineers also perform identities and deal with social norms and stereotypes in the family-society sphere of the COP of the National Elite. In short, what is considered legitimate behaviour for women is different than for men. To make it concrete, it can be seen in the DOI that only the 'real' engineers – the men of big networking capacities who focus on hardware and act 'fully masculine' – make it to the top. In their professional performance, they re-enact norms of masculinity in the DOI, simultaneously making them the new role models in the government and in the COP of the National Elite at large. As can be surmised, the 'fully masculine' performance that is required for full participation in the DOI poses a significant learning trajectory for juniors, both for male and female engineers, though particularly for female engineers. Where masculinity is the norm, self-normalization can be expected to take more effort from women than from men, and also to require different acts of self-justification in relation to norms of male and female behaviour. This chapter identifies activities of legitimate peripheral participation in the DOI and in the next one, I discuss what these 'legitimate' activities imply for female engineers in the DOI.

This thesis also explores how subjects develop desire and agency through transitional performance, here understood as subjects that perceive to have undergone a change during intense experiences in their lives, disconnected from daily practice. As noted, this view has received much less attention in social science. This is strange, because it is precisely in these terms that engineers who see themselves as a 'successful' Irrigation Engineer frame their life and career. It is also strange because the idea of transitional experience is not new (see the work of Victor Turner). Illustratively, Gilmartin (2003) writes about an Indian graduate from Roorkee in 1898 that the 'process of becoming an engineer at the college was like passing through a transformative 'dream', defining an entirely new 'public' identity' (p.3-4). Likewise, Gupta (2007) describes the period of education and training at IITs in India for doctoral students in science and engineering, as a 'period of transition' that goes accompanied by a 'reality shock' (p.508), and notes that this experience primarily takes shape in the informal milieu and is marked by aspects that are 'transmitted through oral culture, by means of trial-and-error, and through practical example' (Delamont and Atkinson, 2001: 101 cited in Gupta, 2007: 508). In a similar fashion, DOI engineers explained to me, almost without exceptions, that two intense experiences in particular made them engineers – the college years and the first years of field practice as part of employment. The Dutch SNV engineers that I interviewed talked mainly about their field experience in Nepal. When asking about their lives, engineers were happy to talk about these experiences, often with heightened emotions, and they iterated how important these periods had been for their career. They talked about these phases as undergoing initiatory and disciplinary practice, as enduring hardship and struggle, while often also feeling emotions of joy, happiness, sorrow and fear.

In recognition that transitional performance remains under-theorized and considering that the Irrigation Engineer is characterised by 'his' passion to make systems work, this line of inquiry focusses on thinking through how it might work and how it relates to the inclusion and disciplining of young engineers in the DOI and in the COP of the Irrigation Organization at large. For this, I use the terms communitas, catharsis and cathexis almost philosophically – anthropology requires sometimes a bit of free-thinking – to imagine and capture some of the qualities of transitional experience. The analysis relies on experiences of respondents of the 9 life history interviews and on conversations with Dutch ex-SNV staff of the Mechi project. Taken together, the working lives of the respondents cover more than 60 years of irrigation history in Nepal and generations of changing professional practice. I acknowledge that the quality of transitions – and how engineers have described their experiences to me – cannot be separated from time bounded contexts. Hence, becoming an engineer in the 1940s and 50s meant something different than in the 1980s and 90s. In the analysis, however, I have largely ignored context to imagine and create conceptual space, how transitional performance might work. Further research is necessary to contextualize transitional performance.

I analyse self-normalization mainly through an interpretation of the questionnaire that I used to document the attitudes and views of DOI engineers. I use it to make some unfamiliar analytical associations and therefore, this chapter proceeds first with a description of the questionnaire. The remaining of the chapter is structured in three parts. One part analyses some of the intersections that exist between performances of Elite Manhood and the practice of the Irrigation Engineer. The second part describes professional desire and engineering pleasures in the DOI and how that relates to job satisfaction, performances of success and promotion. The third part theorises transitional performance and how experiences of 'the college' and 'the field' function as rites of passage on the roadway of the Irrigation Engineer.

4.2 The construction and performativity of a questionnaire

Constructing a questionnaire to document social norms and gender stereotypes in the DOI is a challenge. As noted, speaking about social norms and stereotypes is 'doing gender' in a culturally specific way and is contested terrain (Connell, 2005 [1995]; Czarniawska, 2006). The design of the questions is likely to tell more about 'my' culture than about those of the respondents. Illustratively, to get started, I used an 'Irish social attitudes survey' of the Economic and Social Research Institute (ESRI) in Dublin, designed to document views in 2001-2002 on 'family and changing gender roles' (ESRI, 2001). It was one of the more elaborate surveys that I could find on internet. These type of surveys take the typical middle-class Western household as a reference and it had questions like 'men ought to do a larger share of household work than they do now' (p.Y7). I was aware of the Western orientation of the survey and reflected considerably on it, but it is clear, with hindsight, that some very 'silly' questions have slipped through, like 'being a housewife is just as fulfilling as working for pay' (p.Y7). These type of questions on (unpaid) household work in relation to the position of men and women in the household, are not relevant for the target group that I had in mind. The DOI engineers are mostly from high-class, upper-caste (urban) background and they usually have domestic servants. In this class, the 'wife' is considered responsible for the running of the home, which also may include elderly parents and other family members, but she is not necessarily doing household chores herself. The use of this question reveals my partial 'inability' to reflect on deeply embodied gender stereotypes: I come from a typical middle-class, Western household, my mother's first responsibility was that of a housewife and she struggled to combine household responsibility and child care with a job. It is a textbook example of how difficult it is to do research in an intercultural context on masculinities.

For designing the questionnaire and to get an idea of cultural norms in various places in Nepal, I read (anthropological) literature on Nepal (Bista 1991; 2004 [1967]; Tamang, 2000; 2002; Bennett, 2005 [1983]; Gellner, 2008 [1997]) and also, Nepalese newspapers in English (Himalayan Times, Kathmandu Post) and contemporary novels of Nepalese writers in English (Thapa, 2001; 2005; Wagle, 2008; Upadhyay, 2010). This resulted in the following questions:

- Questions on caste and ethnic background, as well as on the duties of high-caste and low-caste people, knowing about the cultural norms of a Hindu caste system in Nepal.
- Questions on marital status and the meaning of marriage, knowing about practices of arranged marriage, dowry payments and a culture of heteronormativity (Tamang, 2002). The COP of the National Elite is not a marginal COP in Nepal and I expected that its members would conform to norms of compulsory heterosexuality.
- Questions on possible employment of the 'wife' to understand shifts in lifestyles (and norms) of high-class, urban-based household economies.
- Questions on the meaning of religion, knowing about the hegemony of Hinduism in Nepal, the importance of religious observance and the intersections of religion with (joint) family traditions and caste conventions.
- Questions about the role of men as head of the household and the meaning of a son for a family, knowing about norms of patriarchy in Nepal (Tamang, 2000), like the norm that Hindu women are expected to give birth to a son as elsewhere in South Asia.
- Questions about preferences on study and job for their children (if they have any), differentiating between 'sons' and 'daughters' in the knowledge that engineering is perceived as a career for men in South Asia (Nair, 2012).
- Question on male domination in the irrigation engineering, knowing about the numerical domination of men in the DOI (DOI, 2008).

Generally, I can say that open questions like 'as a man/woman, I was always taught to...' and asking respondents to finish the sentence, yielded more interesting results compared to the tick-box answers on pre-defined statements (agree/disagree). Open questions offer space to respondents for interpretation and answers are more likely to reflect 'their' views on cultural norms – a valuable lesson for doing research in an intercultural context on masculinities.

My analysis and interpretation of the questionnaire is built on the performative capacity of a survey (Law, 2009), which implies that views of respondents are simultaneously reflected *and* brought into existence through the answers and representation of the questionnaire. I invite the reader to participate in 'seeing like a questionnaire' to paraphrase the title of an article of John Law 'seeing like a survey' (2009) – and to 'see' the questionnaire in my interpretation. The construction of an 'alternative' performance of views on irrigation professionalism provide for some unfamiliar but worthwhile analytical associations to understand processes of 'culture in the making' in the DOI. The idea is quite simple. When answers are understood as a stylized repetition of acts, they simultaneously tell 'what is' and 'what should be'. In short, answers can also be expected to reveal professional desire and pleasures ('what should be'). To make it concrete, when asking DOI engineers to give a definition of engineering and they write about construction works, it can be seen to describe their views ('engineering is about construction works’), but also, to describe their desire (‘engineering should be about construction work’). It is the second or performative interpretation that I use in this chapter.

As noted, the development of desire and appropriate pleasures in the profession is directly linked to the agency of individuals and their capacity ‘to become’ normal and disciplined in the DOI. As full or aspirant members in the COP of the Irrigation Organisation, it is critical to secure the coherence of the COP and (come) to share and safeguard core values of the COP, meaning that an engineer needs to remain accountable and answerable to one’s knowledge claims in order to stay or become a member (cf. Zwarteveen, 2006). To illustrate: ‘water use efficiency’ can be considered one such a core value in irrigation engineering, something I learned in courses on irrigation system design. This implies that a respondent’s identification of ‘water use efficiency’ in the questionnaire as a top priority in irrigation, can (also) be seen as an act that gives the respondent agency in the DOI and in the COP of the Irrigation Organisation at large. It reveals and simultaneously re-confirms that the respondent has come to associate professional desire and pleasures with the design of water use efficient systems – an individual act of ‘showing’ that one is accountable to the knowledge claims of the engineering profession. In this view, stated and taken-for-granted professional priorities like system construction and water use efficiency can be seen to function as ‘cultural expressions’ of the irrigation engineering profession. To remind the reader, in the view of farmers, ‘inefficient’ water use often goes together with ‘efficient’ irrigation system management. There is always water required to account for the ‘losses’ in the distribution system (without distribution losses, no water delivery) and water is often used as a factor substitute for such inputs as labour, capital and managerial skill (Levine, 1977; Vuren, 1992; Bruins and Heijmans, 1993). These observations exemplify that established priorities in irrigation engineering are partially based on routine and cultural traditions in the profession.

The interpretation of the questionnaire takes the individual engineer as a starting point, focussing on the analysis of pleasures, job satisfaction, performances of success and processes of self-normalization. I am aware that careers of respondents span approximately 30 years of irrigation professionalism in Nepal and that answers can only be meaningfully analysed in a time bound context. Also here, however, the interpretation of the answers has largely been done in an a-historical manner in order to concentrate on the testing of an unfamiliar analytical approach.

4.3 Intersections between Elite Manhood and the Irrigation Engineer

This part of the chapter analyses the intersections between the performance of Elite Manhood and the practice of the Irrigation Engineer, based on an interpretation of the questionnaire.

4.3.1 Cultural performances of DOI engineers at home and at work

Table 4.1 presents the gender, (estimated) age and class category of the respondents of the questionnaire. It shows that female engineers are overrepresented in the sample, covering 25% of the respondents, while there were only 1,5% women in the total core staff of the DOI in 2011 (see Chapter 3). This is no mistake, the purpose was to include as many female engineers as possible, given the subject of study. The sample covered only female officers in the gazetted third-class class category, simply because most of the women engineers had started service 2 or 3 years ago (in 2008-2009). There were just two women in the DOI at gazetted second class positions, one was the agricultural economist. She has been omitted from the analysis because she was not an engineer. Non-gazetted first class officers (overseers) appear underrepresented in the sample, but the numbers do not reflect that 5 gazetted third class officers had started their career in the DOI as non-gazetted first class officers, and had made promotion.

Table 4.1: Gender and class category of respondents

n=36	**Gazetted I**	**Gazetted II**	**Gazetted III**	**Non-gazetted I**	**Total**	
Age range (years)	45-55	35-50	25-55	45-50	**n**	**%**
Male officers	4	7	12	4	27	75%
Female officers	-	-	9	-	9	25%
Total	**4**	**7**	**21**	**4**	**36**	**100%**

Source: Questionnaire 2011.

The background of the respondents (see Annex 22) reflects the personnel profile of the DOI (see Chapter 3), except for an unintended underrepresentation of Madhesi officers. In 2008, Madhesi people constituted 41% of the core staff of the DOI, while there were only 3 Madhesi respondents in the sample (8%) compared to 23 respondents from B/C castes (64%), 9 Newar (25%), and 1 Janajati (3%). The respondents had mainly pursued civil and agricultural engineering education in Nepal and India. In total, 9 and 11 respondents had acquired a first degree at the IOE (Nepal) for diploma and bachelor civil engineering respectively; 3 respondents had pursued a bachelor civil engineering at private colleges in Nepal, and 4 at Indian colleges, notably at Roorkee college. In total, 7 respondents had obtained a bachelor degree agricultural engineering at the IOE (Nepal) or at universities in India and Bangladesh. In total, 17 respondents (47%) had pursued master degree education (ME, MSc, MA) in Nepal or abroad (India, Bangladesh, Thailand, the Philippines, Japan and Germany), mostly in water resources engineering, and irrigation and water management; and 2 officers had obtained a PhD degree, one in the Philippines and one in Japan. These numbers imply that high-level educated officers, those who pursued bachelor education as a first degree, are slightly overrepresented in the sample: 69% compared to 43% in the DOI. Most engineers who responded to the question (n=25) were member of one or more engineering and alumni associations, notably the NEA (75%), the DEAN (35%) and the NSAE (29%). In total, 24% of the respondents had registered their membership with the NEC, the regulatory organization for engineering in Nepal, and there was a fair number of respondents engaged into irrigation specific associations, notably the SIREN (18%) and INPIM/N (also 18%). One engineer was member of 9 engineering and alumni associations in total (Q19MGI).

Most respondents (n=26) came from middle and high class (Hindu) families (85%). Among these classes in South Asia, women's education is considered a 'consumption luxury' rather than a 'productive investment' (Chanana, 2001: 261-286 cited in Gupta, 2007: 510-511; see also ERA, 1973: 18), a view that translates into families being less inclined to invest resources for engineering education in favour of daughters, particularly if those are limited. This dynamic is reflected in the answers of the questionnaire. First, all respondents were familiar with a strict division of labour in their elderly family – the father is or was employed and the mother observes the household sphere – and second, female engineers (n=9) came exclusively from the higher classes. Among male engineers (n=17), 77% came from higher class families, the father being employed as a government or army official, teacher, landlord or businessman, and a minority group (23%) came from lower class families, the father being occupied as a farmer or labourer. In contrast, none of the female engineers came from lower class families, the father primarily being engaged in elite jobs, notably in engineering (33%), and the mother often also having paid work (33% of the mothers of female engineers). Admittedly, the differences are small – both the mothers of male engineers (82%) and female engineers (67%) were involved in household activities – but they indicate that high-class, urban families, particularly in which the mother pursued formal employment or where one of the parents is involved in engineering, are more supportive in sending 'their' girls for engineering education (ERA, 1973; WECS/BSESC, 1996; for India: Parikh *et al.*, 2003).

In South Asia, life and marriage into joint families, following traditional (Hindu) role patterns is (still) the norm, also among the middle and high classes that produce most engineering graduates in Nepal (Adhikary, 1995; WECS/BCESC, 1996; SaciWaters, 2011). The (male) Irrigation Engineer is married, has children and nurtures 'his' joint family, and marriage is a critical step in the lives of engineers for becoming a man (or woman) of worth in the family-society sphere of the COP of the National Elite. This is reflected in the marital status of respondents (n=36) and the reported occupation of the wife or husband (see Table 4.2). All respondents were married, except for those who were (still) young and planned to get married, and most respondents followed Hindu customs in their own marriage – the husband being employed and the wife seeing over the household, an intersection between the performance of Elite Manhood and the practice of the Irrigation Engineer that embodies a significant challenge for female engineers in the DOI (see the next chapter). Table 4.2 shows that the majority of engineers' wives oversee the household (54%), but that it does not occur the other way around – all husbands of the female engineers had a full time job. This illustrates that it is primarily women that are held accountable for domestic tasks, also when they are pursuing (engineering) employment. Women engineers in the DOI need to negotiate their time carefully in the family sphere and in doing the job, while men have ample opportunities to develop a career. However, it also shows that 40% of the wives of engineers have formal employment, either part-time or full-time. This suggests a shift of gender relations among the urban elite, form single-income to double-income household economies, and appears to support the claim of engineers that high-class, urban lifestyles require two incomes.

Table 4.2: Marital status of respondents and occupation of wife or husband

n=36	Male engineers (n=27)			Female engineers (n=9)		
	"wife"		% of married male engineers (n=26)	"husband"		% of married female engineers (n=6)
	n	%		n	%	
Unmarried	1	4%		3	33%	
Household/childcare	14	52%	54%	-	-	-
Study	1	4%	4%	-	-	-
Part-time job	2	7%	8%	-	-	-
Full-time job	9	33%	34%	6	67%	100%
Total	**27**	**100%**	**100%**	**9**	**100%**	**100%**

Source: Questionnaire 2011.

Table 4.3: The person who gave inspiration to study engineering

n=25	Male engineers		Female engineers	
	n=16	%	n=9	%
Parents/family/relatives (unspecified)	5	31%	2	22%
- Father/brother/uncle/cousins (male)	5	31%	4	44%
- Mother/elderly sister (female).	-	-	2	22%
Friends (seniors) and neighbours	7	44%	-	-
Professor/teacher engineering	2	13%	-	-
Scholarship availability	1	6%	-	-
Interest/self-motivation	2	13%	1	11%

Source: Questionnaire 2011. **Note:** Some respondents have given more answers; all the answers have been counted.

In South Asia, educational decisions are family decisions (Gupta, 2007). This is aptly illustrated in Table 4.3 which lists the person(s) that initially inspired the respondents (n=25) to study engineering. The table reveals that there were only 4 respondents (3 male engineers and 1 female engineer) who stated that their inspiration for studying engineering had been purely based on personal interest, self-motivation or scholarship availability. The remaining answers are about persons and peers within the family-society sphere of the COP of National Elite (cf. Udas, 2011). It reveals that it was mainly men who had inspired the respondents as young boys and girls to study engineering – fathers, brothers, uncles, cousins, (senior) friends, neighbours and (engineering) teachers – illustrating that engineering is associated with the performance of Elite Manhood. An exception are some female engineers, who recognized senior female members in the family as role models for engineering – a mother or elderly sister. This dynamic – the gendered cultivation of desire through role models – is also visible when asking engineers about their professional role model. In total, 13 respondents indicated a professional role model, and these were mostly men: leading engineers, charismatic engineering teachers, a deputy director general of the DOI, and often the father or elderly brother, except for one senior male engineer (Q37MGIII) and one junior female engineer (Q38FGIII), who named their mother as a (professional) role model.

Also in other ways, it showed that the cultivation of desire and masculinities in engineering are two sides of the same coin. Respondents were asked about their reasons to study engineering (n=25). Among male engineers (n=16), the most popular answer was related to the ideal of the development of the nation (44%) (see Annex 22). This ideal also inspired female engineers (n=9), but among them, most answers were related to an interest for travelling and the desire to face challenges in engineering related to the low presence of women in the profession (these are responses to open questions in the survey). This suggests that for men, engineering embodies a relatively clear-cut roadway for performing Elite Manhood, while for women, consciously or otherwise, engineering also embodies an opportunity to negotiate or subvert norms of femininity (e.g. travelling, employment, risky jobs). A female engineer responded: '[I choose engineering] because I was told by many that civil engineering was not a subject for girls, as they would not want to work in the fields and would rather have homely [and] safe jobs' (Q39FGIII). Similar answers have been recorded for female engineering students across South Asia (SaciWaters, 2011).

The gendered cultivation of desire in families, among peers and at school, is clearly a cross-generation issue. Table 4.4 illustrates the preferences of respondents for the studies of their children. It shows that the most preferred option is for sons (and also for daughters) to pursue science and engineering education ('becoming an engineer'), followed by medicine and bio-medical engineering ('becoming a doctor'). When considering medicine, bio-medical engineering, nursing and health education as one category, than this shows as the most preferred option for daughters of engineers, though followed closely by science and engineering. This illustrates that engineering studies, like in India, is increasingly considered suitable for girls, though for other reasons than for boys. The aim for girls is not necessarily to pursue a professional career but to become ‘independent’ and secure marriage prospects (see for India: Gupta, 2007; Nair, 2012).

Table 4.4: Preferences of respondents for the studies of their children

n = 18	Son	% of n	Daughter	% of n
Science, engineering	12	67%	8	44%
Medicine, bio-medical engineering	6	33%	5	28%
Management, economics	2	11%	2	11%
Nursing, social work, health education	-	-	3	17%
They decide themselves	1	6%	2	11%

Source: Questionnaire. **Note:** Some respondents have given more answers; all the answers have been counted.

4.3.2 Social stereotypes and cultural specific norms

On the roadway for becoming an Irrigation Engineer, young engineers need to internalize (or negotiate) social stereotypes and cultural norms that prevail in the informal milieu of the COP of the Irrigation Organization. Perceptions, stereotypes and norms that govern the informal milieu may be masked by a general belief in meritocracy and impartiality among engineers (Gupta, 2007), but they embody, in fact, very visible components of the intersection between Elite Manhood and the Irrigation Engineer. I documented social norms and perceptions among DOI engineers by asking respondents to agree or disagree (or neither agree nor disagree) with a statement on gender behaviour (e.g. the man is the head of the household: agree, disagree, neither agree nor disagree), and by asking for descriptions of ‘normal’ (or expected) behaviour of men and women (e.g. women are happiest in life when...: finish the sentence). Annex 23 presents the details of this part of the questionnaire.

When examining the prevailing gender stereotypes among respondents (n=36), it reveals two things. It shows that stereotypes are generally shared by male (n=27) and female engineers (n=9) and also, that male and female engineers differ in terms of their acceptance of social norms, particularly in relation to the more specific stereotypes about professionalism (cf. Gupta, 2007). To start with the first observation, the majority of both male (59%) and female engineers (56%) had the opinion that ‘being a housewife is just as fulfilling as working for pay’, and male (63%) and female engineers (67%) shared the view that ‘women are better than men in maintaining good social relations’. Likewise, both male (78%) and female engineers (56%) agreed that ‘it is important to respect family traditions’. In regard to the second observation, female DOI engineers reject the social norms that are directly related to professionalism with much more vehemence than male engineers. This is no surprise, women engineers have no choice other than to negotiate the norm if they simultaneously want to perform as a woman of worth *and* as an Irrigation Engineer of worth. Almost 90% of the female engineers disagreed with the statement that 'women and men have different duties and obligations in life', compared to just 48% male engineers and a notable 45% of male engineers who agreed with this view. Likewise, 78% of the female engineers agreed that 'women must pursue a professional career' (compared to just 55% male engineers), and 67% of the female engineers disagreed with the statement that 'a job is all right, but what women really want is a home and children' (compared to 41% male engineers). These statements indicate how desire among engineers is gendered. It seems that 'female desire' is (more) closely associated with (biological) desire for care and children, seemingly paradoxically, especially by female engineers themselves: 78% agreed that 'watching children grow up is life's greatest joy' compared to just 41% male engineers. These answers can be considered examples of subjectivation of male and female engineers in the COP of the National Elite.

Another noteworthy observation is that both male and female engineers expressed a clear awareness that 'women and men's responsibilities change through time' (both agreed for 100%). However, the 'awareness' of respondents was largely based on the association of prevailing social stereotypes and cultural specific norms with backwardness and with the past, blaming in particular the 'religious social structure' in Nepal (Q6MGIII). Interestingly, this is also how Western experts are 'aware' about gender relations in Nepal. They consider gender inequality in Nepal mainly as the product of Hindu customs, turning basically a blind eye to their own gendered behaviour (cf. Chhetri and Lingen, 1998). It reflects a general belief in modernity, and in meritocracy and impartiality in engineering (Gupta, 2007). In other words, the answers reveal – more than actual changes of gender norms in the informal milieu – that Nepalese engineers, educated men and women of bikas, ought to desire for modernity (as in the West), and need to associate themselves with ideals of (liberal) gender equity. There are many examples here. Both male (52%) and female engineers (56%) disagreed with the statement that 'religion should play a central role in people's lives', and they also disagreed that 'high-caste and low-caste people have different duties and obligations in life' (male engineers: 55%, female engineers: 56%). Similarly, 89% of both male and female engineers opposed the (Hindu) tradition of paying dowry to the bridegroom's family, and 78% of both genders disagreed with the statement that 'the family is incomplete without a son'.[27] Another one that fits the picture is that the majority of male (44%) and female engineers (45%) had the opinion that 'men ought to spend more time with their children'. It suggests that the desire for performing modernity and liberal forms of gender equity, also implies thinking 'liberated' about family relations. Illustratively, no less than 81% male engineers and 89% female

[27] The dowry system is said to be particularly strong in Madhesi communities and the answer here may not be representative for the DOI engineering community due to the underrepresentation of Madhesi engineers.

engineers disagreed with the statement that 'a man's job is to get money and a woman's job is to look after the home and family'.

The answers reveal the complexity of social stereotypes and culturally specific norms in the informal milieu of the COP of the Irrigation Organization. Social norms reflect what is expected or considered what *should be* the case, rather than what people actually do in practice. Per definition, nobody enacts the social norm perfectly and in theory, every young engineer, whether male or female, has to internalize (or negotiate) gender stereotypes and social norms in one way or the other, although this requires a more active stance of female engineers in the COP of the Irrigation Organization (see Chapter 5). On the one hand, the answers of the questionnaire suggest that members in the COP of the National Elite have gender opinions that are much less conservative than is suggested in literature, at least when asked individually (Tamang, 2000; 2002; Gellner *et al*., 2008 [1997]). The opinions on social norms of DOI engineers can be considered comparable with opinions of (elite) men and women in the West, and equally 'enlightened' in the perspective of Western liberal feminism. On the other hand, the contradictions with actual practice are apparent. The majority of respondents were married (see section above), mostly through practices of arranged marriage and dowry payments. The majority of engineers stated to oppose dowry payments, but they were reluctant (or unable) to oppose the practice at their own marriage, and they also stated that it is important to respect family traditions. Likewise, the opinion of the majority of male and female engineers that the family is not incomplete without a son, does not take away that sons are important in Hindu culture – they become the head of the household, they inherit land, and are expected to take care of the parents, while daughters move out of the elderly house upon marriage (Bennett, 2005 [1983]; see for India: Gupta, 2007) – meaning that engineers and their families, in practice, partially at least, need to go along with the social norms of members in the COP of the National Elite, favouring the birth of boys over girls.

Based on all the answers of DOI engineers that I have collected through the questionnaire, I have distilled stereotype profiles for male and female members in the COP of the National Elite (see Annex 23 for the detailed answers). These normative profiles can then be compared with the performance of the Irrigation Engineer and intersections can be made visible:

> ***An elite or educated, upper-caste woman in Nepal:*** The focus of the woman is 'her' household and she is supposed to take care of the children and the family at home. She is most happy when she is married and has a good and healthy spouse. A secondary concern for her is employment and having an independent status through her income. Her qualities lie in emotional attachment, loving and maintaining social relations. She is primarily concerned about her dress and appearance and she competes with other women over her beauty. A woman experiences difficulties in her

life when she is dominated by her husband or is subject to domestic violence and/or has to deal with a drunken husband. The most difficult issue for her is to share a previous love affair or acts of cheating on her side. A woman is also worried about getting older and the loss of beauty. She gets depressed when she is married to the wrong husband, receives no love and care, or experiences household burdens and issues of scarcity in the family sphere. The lack of opportunities for study or employment is a secondary reason for disappointment. A woman feels pressurized and gets angry when her husband is not in line with her, when her husband is cheating, or when her demands and needs (often related to the family) are not fulfilled.

An elite or educated, upper-caste man in Nepal: The focus of the man is 'his' job and he is supposed to safeguard the household in society. He is most happy when he has secured a job, has become self-reliant, has achieved high social status for him (and the family), and becomes successful, rich and prosperous. A man competes with other men over his social status. His qualities lie in his profession and doing 'outside' work. He is suitable for activities that require strength, knowledge and analytical skills, and has the capacity to make decisions and act as a strong, responsible and visionary leader. It is difficult for a man to share emotions with others (sorrow, pains, tears, loneliness, fear, grief), and he is not expected to show his weaknesses and mistakes. A man experiences difficulties in his life when things develop beyond his means and circle of influence, particularly when demands and needs remain unfilled in the family sphere. In this regard, men get depressed about being unsuccessful, about the (potential) loss of a job and income, and about limited prospects in their careers. Success is a personal matter for a man (and failure a personal mistake). Men are expected to have an ego and get angry when things do not get their way, particularly when he feels dominated by his boss at work.

The stereotype profiles for elite men and women as shared among DOI engineers *at the group level*, reflect the norm of the patrifocal kinship structure among upper-caste Hindu people in South Asia – the subordination of an individual to the family; patrilineal inheritance; patrilocal descent and residence; gender differentiated family roles; family control of marriage arrangements; and an ideology of appropriate female behaviour emphasizing chastity, obedience, domesticity and adaptability (Gupta, 2007: 510). Although engineers may think different about this *at the individual level*, it is evident that the social stereotypes and cultural norms that govern the informal milieu of the DOI, embody formidable challenges, both for male and female engineers – though more for female engineers – to internalize the 'right' performance of Elite Manhood and become a 'real' Irrigation Engineer.

4.3.3 Engineering and the characteristics of the Irrigation Engineer

In order to find out what engineering meant for respondents, and to understand in what way those meanings are gendered in the informal milieu, the questionnaire included open questions on the definition of engineering, as perceived by respondents, and what characteristics need to be fulfilled (or internalized by young engineers) for performing as an engineer in the DOI. Based on these answers, I have formulated the mainstream meaning of engineering in the DOI and summarized a stereotype profile of the Irrigation Engineer (see Annex 24 for the detailed answers):

> ***The meaning of engineering in Nepal:*** Engineering is the science of applied technology, synonymous with technical works. It is an art, designing buildings and structures, based on the application of mathematics and the use of tools. Engineering is about creating a perfect system that works like an engine, safe and efficient, based on a clear concept or design. Engineering aims to increase (cost) efficiency and optimize resources use, ideally in an environmental friendly way. The goal of engineering is to fulfil social needs and solve human problems; engineering is development and engineering works are progress.
>
> ***The Irrigation Engineer in Nepal:*** The Irrigation Engineer is a devoted development worker. 'He' always works hard for social progress, and labours dutifully and with commitment for the development of the nation and the engineering profession. An engineer has obtained the proper engineering education qualifications and is not just a bookworm with good grades. 'He' has first-hand experience and practical knowledge on the application of scientific and mathematical principles (design, survey, make accurate estimates etc.) in order to develop available natural resources and meeting social needs in local situations. An Irrigation Engineer is part of a system, disciplined to cooperate in a team, guiding others in their work, and a friend among other engineers. 'He' is technically competent, innovative and strives for perfection; his job is acting efficient, analytical and pragmatic. Engineers are honest, creative, intelligent and have a soft spot for social values and the needs of the nation. The Irrigation Engineer shows competitiveness, is ready to face challenges and develops a dashing personality that is required to identify the future problems of the people and the nation.

When analysing the definitions of respondents, first, it reveals that most descriptions of an Irrigation Engineer mention 'he', revealing a deep association with men, masculinities and the performance of Elite Manhood. This is also reported in other studies (SaciWaters, 2011: 20). Second, 'engineering' is more than technical work, calculations and the application of mathematics. The respondents equated engineering with development, modernization and social progress, and the engineer is essentially defined as an artist or development worker in the context of nation building. As described in Chapter 3, a perceived 'need' for engineers became a priority concern in the 1950s *because* Nepal had set course on a project of national progress (Stiller and Yadav, 1978). Engineering, modernity and nation building have never been perceived separately in Nepal, hence, engineering works *are* modernity and an engineer *is* the development worker (see Nair, 2012 for comparable views in India). The third observation confirms that engineering education alone is not sufficient for becoming an Irrigation Engineer. The definitions reveal that it is necessary (1) to gain field experience for practical knowledge and to learn about local situations; (2) to get involved in the application of engineering knowledge – the design, construction and implementation of technical works; (3) to work as part of a team of engineers; *and* (4) to develop a personality that is associated with engineering. These activities are not just about improving the technical performance of engineers – engineering education in South Asia is known to be heavily theory focussed (WECS/BCESC, 1996) – but also about improving the cultural performance of engineers. This 'list' is a rough outline of activities that qualify for legitimate peripheral participation in the DOI. Field work, design and construction, and being part of a team, embody for young engineers, acknowledged activities to learn about the performance of an Irrigation Engineer.

A fourth observation is the close fit that exists between the stereotype profile of the male member in the COP of the National Elite, and that of the Irrigation Engineer, especially in contrast to the apparent 'misfit' with the stereotype profile of the female member in the COP of the National Elite (see above). The performance of Elite Manhood is about showing strength and becoming a responsible and visionary leader; and this is exactly where the performance of the Irrigation Engineer comes in. In contrast, the performance of femininity is about displaying chastity, obedience and adaptability, about showing emotional attachment and maintaining social relations. This performance is deeply alien to that of the Irrigation Engineer. The activities that qualify for legitimate peripheral participation, located mostly 'outside' and in the field, constitute a formidable challenge for female engineers to integrate into the DOI. For them, it is more difficult than for men to perform a personality than is associated with the Irrigation Engineer (see Chapter 6 for further discussion).

4.4 The cultivation of desire and passion in the informal professional milieu

For becoming an Irrigation Engineer, junior engineers need to learn about, and acquire desire and passions for their profession. As argued above, scrutinizing desire among engineers is a prerequisite for analysing the development of agency among young professionals ('I want this') and their capacity to claim a performance of success ('I have fulfilled my goal'). A successful performance is defined here as one that is acknowledged, approved and recognized by (senior) peers (cf. Paechter, 2006). To recall, getting an opportunity to learn about the 'appropriate' desire through self-normalization is critical for developing an experience of self as an Irrigation Engineer and crucial for cultivating an act to remain accountable to one's knowledge claims. Stated priorities and tasks in the irrigation sector can thus not be taken for granted in this study, but need to be analysed as socially constructed and strategically nurtured expressions of a (masculine) engineering culture in the DOI. This part of the chapter analyses the pleasures and priorities that young engineers need to internalize for developing agency, and analyses the roadways in the DOI for becoming a 'real' Irrigation Engineer.

Before starting the analysis, it is worth iterating that a performance of success – one that is acknowledged by peers in the informal milieu – is absolutely critical for becoming a 'real' Irrigation Engineer. This is illustrated by answers on the open question what engineers seek to achieve in their life (see Annex 25). In total, 35% of the engineers (n=20) stated that they seek to establish themselves as a good, reputed and recognized irrigation engineer among colleagues, and aim to *become* a personality, followed by 25% stating their desire to build irrigation facilities 'in the whole country' to increase agricultural productivity in Nepal. These answers show that being successful – being recognized by colleagues – is highly valued and is linked to the rather abstract ideal of constructing irrigation facilities *in the whole country*. In contrast, security of employment – a very practical goal – was only mentioned by 20% of the engineers. This suggests that a cultural performance of success is considered equally or even more important by engineers than the prospect of direct material benefit – a salary.

4.4.1 Professional pleasures and priorities

To document desire that young engineers need to internalize, the respondents were asked what they considered important tasks and priorities in the irrigation sector. All respondents had a minimum of 2 years employment in the DOI and could thus be expected to know about this subject. The assignment was to mark a maximum of 8 professional tasks out of a list of 22 tasks, which I had compiled myself based on my knowledge of engineering and irrigation policy and by using my experience of team work in a professional (office) environment (see Annex 26). The result provides for a priority score for male and female engineers and for an undifferentiated or total score (see Table 4.5). Similarly, respondents were asked to prioritize 12 concerns in the irrigation sector, from 1 (top) to 12 (bottom). Also this list, I had compiled myself based on my knowledge on (irrigation) engineering principles and on contemporary irrigation policy goals. Here, it was indicated that an important concern – system design and construction – was not on the list, and therefore, I have included it in the presentation of the results as the top concern (see Table 4.6). Saliently, I had meant the question as 'priorities in irrigation sector development', assuming that this is inherently about system design and construction for engineers. My 'failure' to make it explicit and write it on the list as a 'possible' concern in the profession is an example of how my professional education – and personal pleasures in doing my job – have seeped through in the questionnaire. I reflect on the compilation of the lists on professionals priorities and concerns in the chapter's conclusions.

Table 4.5: Important tasks in irrigation

Answer (n = 35)	**Male (n = 26)**	**Female (n = 9)**	**Total (n = 35)**
(Upgrading) designs of irrigation systems	(2) 22	(1) 9	(1) 31
Talking with farmers about irrigation and project matters	(1) 24	(6) 4	(2) 28
Field surveys	(3) 19	(3) 6	(3) 25
Delivering/ finishing a project by the targets of the plan	(3) 19	(6) 4	(4) 23
Taking part in formulating new policy	(6) 16	(2) 7	(4) 23
Setting up and cooperate with a Water Users Group	(5) 18	(6) 4	(6) 22
Exchange of experiences by attending seminars	(7) 15	(-) 2	(7) 17
Capacity building and integration of female colleagues	(-) 9	(3) 6	(8) 15
Cooperation with other government departments	(-) 9	(5) 5	(9) 14
Capacity building and supervision of younger colleagues	(8) 12	(-) 1	(10) 13

Source: Questionnaire 2011. **Note:** Some respondents gave only one or two activities, others gave eight. All answers have been added up. The rank number is shown between brackets.

Table 4.6: Priorities in the irrigation sector

Answer (n = 35)	**Male (n = 27)**	**Female (n = 8)**	**Total (n = 35)**
System design and construction	(1) (--)	(1) (--)	(1) (--)
Water use efficiency	(1) 3,8	(2) 5,1	(1) 4,1
Equity in water distribution	(2) 4,3	(1) 4,9	(2) 4,4
Increase productivity	(3) 4,4	(9) 6,8	(3) 4,9
User participation	(4) 5,3	(7) 6,1	(4) 5,3
Operation and maintenance of irrigation systems	(5) 5,8	(3) 5,4	(5) 5,7
Sustainable & integrated use of water resources	(6) 6,6	(10) 6.9	(6) 6,7
Control water distribution	(9) 7,3	(8) 6,6	(7) 7,1
Enlarging command area	(7) 6,9	(12) 8,1	(8) 7,2
Irrigation Service Fee collection	(8) 7,0	(11) 7,8	(8) 7,2
Institutional strengthening of the government	(10 8,4	(6) 5,9	(10) 7,8
Reducing water conflicts	(11) 8,5	(4) 5,8	(11) 7,9
Gender	(12) 9,3	(4) 5,8	(12) 8,5

Source: Questionnaire 2011. **Note:** Some respondents gave only two activities, others gave average rankings, i.e. marking tasks by '1' and others by '2'. All answers have been added up and divided by n to get an average score. The rank number is shown between brackets.

The tables show that professional tasks are well established among engineers – the central mission of the Irrigation Engineer is the design, construction and upgrading of irrigation systems, and for this, engineers need to talk with farmers about project matters, do field surveys, and make sure that projects are delivered on time according to the targets of the plan (see Table 4.5, priority 1 to 4; the tasks have been ordered by rank number, which is shown between brackets in the table). Other tasks, such as policy formulation, setting up WUAs and cooperation with other departments, are essentially considered secondary tasks. The same pattern is visible in the ranking of priorities by the respondents (see Table 4.6). Also here system design and construction was the top priority, based on principles of (system) water use efficiency and equal water distribution over the command area, with the objective to increase agricultural productivity. Other activities, such as users' participation, and operation and maintenance of irrigation systems, appear to have mainly meaning in relation to system design and construction, and the objective of increasing agricultural productivity.

Table 4.5 and 4.6 suggest that male and female engineers list professional tasks and priorities in a similar ranking, but also that female engineers rank professional priorities differently. Both male and female engineers identified the design and construction of irrigation systems, based on principles of water use efficiency and equal water distribution, as the top priority in the irrigation sector (see Table 4.6, priorities 1 and 2 in any of the columns). At the same time, however, female engineers ranked capacity building and integration of female colleagues in the DOI as a top priority (see Table 4.5, priority 3 among female respondents). In contrast, male engineers did not consider this an important task at all, at least not important enough for a top eight ranking. Contradictions are apparent – considering system design based on water use efficiency as a top priority excludes the possibility of considering other tasks also as a top priority such as the integration of female engineers in the DOI – but the answers of female engineers compared with those of male engineers can be considered to embody the complexity of women's agency in the DOI, exemplifying strategies of compliance and resistance. The question is not 'which of the two options can be considered as women's agency' (SaciWaters, 2011: 22), but how these 'opposing' acts of agency enable female engineers to develop an experience of the self as a DOI officer. It reveals that men can execute their work without showing any aspirations to work with women, while female engineers, for doing their duties, need to cultivate an aspiration to work with male colleagues, and thus need to display a desire similar to that of men *as engineers* (compliance) while also showing a desire to get integrated and acknowledged *as female engineers* (resistance).

The answers basically reveal that female engineers seek to work out a gender performance as a 'good' Irrigation Engineer *without* compromising their performance as a 'good' woman. The reconciliation of these two knowledge claims is an arduous task for women in the informal milieu of the DOI and the development of agency among female engineers is deeply informed by it. Unlike their male counterparts, female engineers rank the partaking in policy formulation and cooperation with other government agencies as important tasks in the irrigation sector (see Table 4.5, priority 2 and 5 among female respondents), while the norm is that these are considered secondary tasks in the DOI, often left as consultancy jobs for foreign experts (see Chapter 3 for this dynamic). Apparently, these particular activities give meaning to the career of female engineers, structuring their professional aspirations diversely. This is basically an example of a double subjectivation that women undergo in the DOI. By focussing on irrigation tasks that are considered secondary among engineers, and finding meaning in it, female engineers secure their subordination, but it also provides for the means by which female engineers become self-conscious identities *and agents* as DOI staff. It is in this subject position – as 'good' women in the DOI – that female engineers have agency and can develop alternative professional aspirations. Female engineers consider gender – understood as synonymous with women's issues by the respondents – a fourth professional priority in the irrigation sector, while male engineers rank it as the lowest priority (see Table 4.6).

As argued, being passionate about the acknowledged tasks and priorities is critical for young engineers to perform up to the norm of the Irrigation Engineer. This can be illustrated by asking engineers what they consider the most pleasurable in their job – the result is a near exact match with above mentioned irrigation tasks and priorities (see Annex 26 for the details). In total, 32% of the respondents (n=19) – the most mentioned answer – stated that they experience most pleasures in designing and drawing new projects. Other pleasures are related to the development and completion of infrastructure (21%), field work (21%) and the interaction with farmers to perform work that directly impacts the livelihoods of poor people (also 21%). These pleasures pointedly illustrate that stated irrigation tasks and priorities are deeply informed by professional desire and vice versa, which in turn inform the development of agency of male and female engineers and their capacity to act in the informal milieu of the DOI. The agency of a young male engineer who aspires to become an Irrigation Engineer of worth, is clearly visible in the following statement. He noted that he experiences most pleasures in his job 'when water is delivered to barren land through [an] irrigation system, so that farmer[s] can get [the] benefit by increasing [agricultural] productivity' (Q21MGIII).

4.4.2 Job satisfaction and performances of success

When passions and motivations of irrigation engineers are socially constructed and gendered, as suggested above, it follows that performances of success also are socially constructed and gendered. It can be expected that it is linked more or less directly to levels of job satisfaction and promotion opportunities in the organization (see Table 4.7; see Annex 27 for detailed information). Table 4.7, first, reveals the relation between job satisfaction and service class category: those who serve in a higher service class category as a result of promotion, feel more satisfied (or vice versa; they have been promoted as a result of displaying job happiness), and second, female officers appear to feel less satisfied in their job than their male counterparts in the same service class category, suggesting that a performance of success is more difficult to achieve (or feel) for them than for male engineers. The ability to perform successfully and feel happy about job performance appears to be related to service class category *and* gender for female officers, while for male officers it is only related to service class categories.

Table 4.7: Job satisfaction by gender and class category

Answer (n=33)	Male (n=26)	Female (n=7)	Total (n=33)
Gazetted I (n=4)	7,8	-	7,8
Gazetted II (n=6)	6,7	-	6,7
Gazetted III (n=19)	6,8	6,1	6,5
Non-gazetted I (n=4)	5,3	-	5,3
Total	**6,7**	**6,1**	**6,5**

Source: Questionnaire 2011. **Note:** Marked by respondents on a scale from 1 to 10

For instance, a junior male engineer explained his happiness in his job as follows: 'I am in a position to help [and] serve our Nepali community for income generation by supplying efficient water [to] their field by construct[ing] canals' (Q6MGIII), and another junior male engineer noted that he was 'happy because I have dealt with [many] issues while working [in the DOI] which has provided me a lot of motivation and recognition' (Q23MGIII). These statements illustrate the agency of young male engineers: they can show and claim, without many problems, a mainstream performance of success, one that is recognized by (male) peers and seniors, and is associated with irrigation engineering (bringing water to the fields, helping the people of Nepal). In this context, there is little to be unhappy about other than that there is 'no (...) skill development programme [in the DOI]' (Q7MGIII).

In a position of double subordination, female engineers develop agency differently, and for them, it is more difficult to show and claim a mainstream performance of success in the DOI. For instance, two female engineers explained their job satisfaction in the following words: 'I am happy about the nature of work [that] I am doing; I need to experience a lot in this job' (Q22FGIII), and 'I am happy that I can travel and teach farmers, and see new place[s] and agricultural practice[s]' (Q38FGIII). These statements are markedly less articulated about engineering pleasures and are silent on recognition among peers and seniors, thus raising doubts about whether these junior engineers perform up to the (cultural) norm of the Irrigation Engineer. In this context, female engineers have serious issues to be unhappy about, particularly how (male) peers and seniors respond to their gender, because their professional credibility is at stake. Illustratively, junior female engineers were very articulate at this point: '[I am] unhappy about others thinking [and] feeling that girls cannot go to [the] field/site/remote places to work' (Q28FGIII), and 'I feel [not] satisfied because I know [that] there are many opportunities and I am not getting it just because I am a female' (Q31FGIII).

Such statements have been recorded among women water professionals across South Asia (SaciWaters, 2011), and reveal that job satisfaction and performances of success in the irrigation sector are deeply gendered and have strong masculine connotations.

That having been said, apart from the differences between male and female engineers, both genders shared genuine feelings of performing successfully based on their status as juniors. Both junior male and female engineers stated, as newcomers in the organization, that they had learned a lot in a short time, making them successful professionals, and they also indicated that it was too early to claim the status of a successful professional. In Nepal, such an act is considered disrespectful towards seniors. Thus, when asking junior engineers whether they considered themselves a successful professional, typical answers were: 'No, I am a newcomer, so now (...) I cannot say [that] I am successful, [but] this means [neither] unsuccessful' (Q6MGIII), and 'no, because I am just a beginner; it takes a long way to go' (Q31FGIII). Although junior female engineers, in relation to their gender, were particularly concerned about the difficulties that they faced in performing their job successfully, they did not feel insecure in their job position, at least not more (or less) than their male counterparts in the same service class category (see Annex 27 for the details). Generally, respondents felt secure in their position as it concerned permanent employment in the civil service.

4.4.3 Roadways to success (and promotion) in the DOI

Internalizing professional desire and cultivating irrigation passions through processes of self-normalisation in the informal milieu is a continues process and an integral part of the career growth from junior to middle-aged engineers, and from middle-aged to senior engineers. To understand how engineers develop agency in their career, and how their capacity to enact a successful professional performance in the DOI translates into career opportunities, this section documents the roadways in the DOI for becoming a (senior) Irrigation Engineer of worth. Here, roadways are conceptualized as sets of activities that qualify for legitimate peripheral participation, as activities that provide apprentices an opportunity to learn about the technical and cultural performance of an Irrigation Engineer. As argued earlier, the ability to master a successful performance in the informal milieu of the DOI as an Irrigation Engineer, translates more or less directly into career opportunities and promotion. To iterate, the analysis in this section is not about the formal procedures for promotion, but it presents the views of respondents on the technical and cultural performance that is required for making a career in the DOI. A compilation of these views is presented in Table 4.8.

Formally, there are two roadways in the DOI for promotion (see Table 4.8, top box). The first is the middle road (See Chapter 2 and 3). On this roadway, a graduate with a diploma civil engineering enters the civil service as a non-gazetted first class officer and assumes service in the DOI as a junior overseer. Generally, when becoming middle-aged officers, frequently after 15 years of service, they qualify for time-based promotion to the gazetted third class category. Overseers are at the lower end of the DOI hierarchy and competence-based promotions appear rare (ERA, 1973 mentions that competence-based promotions for middle level technicians were practically non-existent). In theory, they can secure further promotions to gazetted second and first class positions, particularly when a bachelor degree in civil engineering is obtained, but I did not come across such cases in the DOI. The second roadway is the high road. Here, a graduate with a bachelor degree in civil or agricultural engineering enters the civil service as a gazetted third class officer and assumes service in the DOI as a junior engineer. Then, competence or time based promotion follows to a gazetted second class position. Ideally, an engineer secures two promotions during the full service time in the DOI – and in exceptional cases a third promotion to the gazetted special class – but often it remains with one promotion, either time or competence based.

Table 4.8 summarizes the views of respondents on these roadways and what performances are required in the informal milieu for a career in the DOI, respectively for becoming a junior, a middle-aged and a senior Irrigation Engineer. As shown in Table 4.8, junior engineers are expected to act as obedient, disciplined and hardworking, and must be ready to obey seniors and execute the work that is given to them. For making a career and receiving recognition among peers, it is critical that juniors get involved in construction and system management, do field work, and get a chance to work in a team of engineers. These activities qualify for legitimate peripheral participation and provide juniors with the minimum requirement of about 5 years of experience, allowing them to translate theory into practice *and* to learn about adopting the appropriate professional performance, which can be defined here as acting sincere, patient, friendly and diligent, and *becoming* an efficient, responsible and capable Irrigation Engineer. Particularly the latter characteristics have strong masculine connotations (see the description of the elite man above). At this stage, career development critically depends on opportunities that are given by seniors or are created through personal connections within the COP of the National Elite, and especially for female engineers, the support that they receive from family to travel to the field and work in remote areas of the country.

Middle-aged engineers in the DOI are expected to act innovatively and develop a clear irrigation vision. For this, they need to get involved in planning activities and policy making at divisional offices at the district level, or at the central offices in Kathmandu. They must secure opportunities for coordinating office matters and engineering projects, and show their capacity to deal with social problems in the field (between farmers, between the DOI and farmers, or between government agencies). At this stage, office matters and coordination are the most important tasks that qualify for legitimate peripheral participation, providing engineers with chances to acquire management skills, and develop an attitude for guiding junior engineers. Simultaneously, participation in these activities provides them with opportunities to learn about the appropriate 'masculine' performance of leadership, which can be defined here as acting as a reserved and trustful senior with good faith, who takes action promptly and confidently. I write masculine, because seniority in the DOI is associated with men as there are no female top officers in the DOI. At this phase, opportunities depend on being able to work with a friendly team of colleagues, because leadership skills can only be developed, recognized *and enacted* at an office with motivated engineers, and among peers who are willing to cooperate and share experiences.

Senior engineers are defined by their vision and a 'masculine' performance of leadership. Activities that qualify for legitimate participation at this level are monitoring and evaluation tasks, departmental planning, design of office structure, and the formulation of development and management plans at the central level. This provides them with opportunities to show their analytical capacities and decision making abilities. At this level, such opportunities need to be created by using professional and personal networks in the government. A critical aspect of a successful performance of a senior Irrigation Engineer is to build alliances among political leaders and secure (political) support for promotion (ERA, 1973: 34 mentions this already). Career development at this level depends a great deal on recognition among peers, and showing to peers the expected high level of work competency. Critical for promotion is the enactment of a normal 'masculine' performance of a senior Irrigation Engineer.

These gendered roadways structure desire and aspirations among engineers and how they are internalized. Junior engineers are (and need to be) proud on the successful completion of a designed project, and share success stories among colleagues about 'working day in day out with locals to make it happen' in a project that was assigned by a senior engineer (Q39FGIII). Middle-aged engineers boost about their equal knowledge level on survey, design, estimate and implementation, and are keen to tell about their working experience in remote areas in the country, sharing success stories among their colleagues about new ideas and policies, such as the implementation of a 'women leading package' in the 'Integrated Crop Water Management Project' (Q26MGII). Senior engineers lean on their achievements, and take pride in the recognition that they get from peers and from 'target groups'. They have plenty of success stories available for showing their performance, for instance, the certification of the WUA in Naubise Phant Irrigation System and the solution for the (de)silting problem in Begnas Irrigation System (Q19MGI). Acting proud and telling the right success stories at the right time, are critical elements in the mastering of an overall normative performance of success.

Table 4.8: The technical and cultural performance required for a career in the DOI

Middle road: Entry: NGI (junior/ middle-aged overseer) > promotion: GIII (middle-aged/senior engineer) > retirement

High road: Entry: GIII (junior engineer) > promotion: GII (middle-aged/senior engineer) > promotion: GI (senior engineer) or retirement.

Age	Activities	Knowledge and skills	Attitude	Other characteristics
Junior Irrigation Engineer	(1) Compete in open exams and interviews of the PSC. (2) Execute the job and meet the targets given by the boss. (3) Get involved in construction work and system management. (4) Get involved in team work. (5) Get involved in field work. (6) Get 5 years of experience.	(1) Technical knowledge from the book. (2) Basic administrative and management knowledge on government and DOI procedures. (3) Technical knowledge from the field.	(1) Good behaviour, uphold professional ethics and morality. (2) Obedient, disciplined and hard working. (3) Honest, confident and bold in decision making (act with courage).	(1) Higher education qualifications. (2) Some previous work experience. (3) Opportunities given by seniors for field work and professional training. (4) Support from family and friends (for female engineers). (4) Being (politically) connected among the elite.
Middle-aged Irrigation Engineer	(1) Planning and policy making at the district level. (2) Coordinate office matters and engineering projects. (3) Policy and strategy formulation. (4) Interact with peers; attend seminars.	(1) Good management knowledge, as well as field and technical knowledge. (2) Capacity to deal with social problems in the field, and decision making ability. (3) Knowledge sharing skills (for guiding juniors).	(1) Sincere, patient, friendly and diligent. (2) Efficient, capable and responsible. (3) Act innovatively and present a vision with a clear concept.	(1) Regular training about new technologies. (2) Friendly work environment (being able to work in a good team). (2) Being (politically) connected among the elite.
Senior Irrigation Engineer	(1) Departmental planning and designing of office structure. (2) Formulation of development and management plans for the department. (3) Build alliances with political leaders.	(1) Good organizational skills. (2) Analytical capacities and decision making abilities. (3) Monitoring and evaluation skills.	(1) Present a clear vision and act with leadership. (2) Reserved, good faith and trustful. (3) Technically sound, confident and prompt, and smart in undertaking actions.	(1) Show a great level of work competency. (2) Recognition from others. (3) Being (politically) connected among the elite. (4) Secure (political) support for promotion.

Source: Questionnaire. **Note:** See Annex 28 for details.

Table 4.9: The activities of officers in the DOI

Answer (n=22)		Male engineers (n=15)				Female engineers (n=7)
		Gazetted I (n=2)	Gazetted II (n=3)	Gazetted III (n=9)	Non-gazetted I (n=1)	Gazetted III (n=7)
Field related work	Design of projects and systems	15%	5%	27%	30%	11%
	Field work (survey, talk with farmers)	15%	20%	13%	20%	8%
	Supervision of projects	37%	10%	19%	8%	6%
	Sum 'field related work'	**67%**	**35%**	**59%**	**58%**	**25%**
Office related work	Office, department, consultants	10%	30%	9%	20%	7%
	Writing reports and proposals	10%	13%	11%	15%	11%
	Paper work	8%	17%	17%	7%	41%
	Other (seminars, unspecified)	5%	5%	4%	-	16%
	Sum 'office related work'	**33%**	**65%**	**41%**	**42%**	**75%**

Source: Questionnaire

These roadways constitute formidable barriers for young engineers to become an Irrigation Engineer through self-normalization. Getting access to the right activities for legitimate peripheral participation at the right time is a demanding challenge in the informal milieu of the DOI, particularly for female engineers. The 'regulation' of participation into such activities can be conceptualized as a nurtured strategy to control the inclusion of young professionals in the COP of the Irrigation Organization. From the point of view of male engineers, this nurtured strategy is about keeping away junior female engineers deliberately from seeking site-related experience (see also SaciWaters, 2011: 20), with the apparent goal to guard performances of Elite Manhood as an exclusive domain of men. From the point of view of female engineers, this nurtured strategy is about developing an experience of self as DOI officials, *without* compromising their performance as a 'good' woman. To understand how these 'gendered strategies of agency' are manifest on the work floor, respondents were asked to indicate the time spend on daily tasks (in percentage). The result is shown in Table 4.9 by service-class and gender category. It shows that low class officers (non-gazetted first class and gazetted third class), mostly junior and middle-aged overseers and engineers, spend most of their time on field related work (design and supervision of projects, and related visits). Gazetted second class officers spend most of their time on office related work (paper work, writing reports and proposals, and other office affairs); and first class gazetted officers spend most of their time on project supervision (defined here as part of field related work). These time allocations match with the roadways described above. Table 4.9 pointedly illustrates where the crux lies for female engineers. Compared to their male counterparts in the same category, female engineers *choose* or *end up* doing twice the amount of office related work, and less than half the amount of field related work. For becoming an Irrigation Engineer, this is a problem because paper work is not considered an activity in the DOI that qualifies for legitimate peripheral participation at the beginning of a career. Hence, it does not provide for an opportunity to improve technical skills nor to learn about a required 'masculine' performance for becoming an Irrigation Engineer.

4.5 Rites of passage for becoming an Irrigation Engineer

This section thinks through how young engineers (can) become an Irrigation Engineer through transitional performance. As explained in the introduction, two phases in the lives of DOI engineers can be seen to function as rites of passage for becoming an Irrigation Engineer – the college and the field. The starting point for analysis is the realization that an Irrigation Engineer is essentially defined by 'his' passion for irrigation and engineering (as shown above), and the claim of engineers to have 'found' passion in undergoing intense experiences that are described as disconnected from the ordinary life. These claims are difficult to reconcile with the view that desire is predominantly internalized through daily interactions with seniors and peers in processes of self-normalization. The goal is here to understand how particular activities or career phases function as rites of passage for the Irrigation Engineer, and how these activities or phases awaken in engineers genuine passions for belonging and invoke in them a deep desire for acts that reproduce the dominant culture and aim towards continuity, stasis and stability. Bringing back into focus international cooperation between Nepalese engineers and engineers from the West is important here, because undergoing specific rites of passage jointly, notably in the informal milieu of the field, may explain how Nepalese and Western engineers come to share passions for irrigation and engineering, and develop a sense of belonging 'as men' and 'as engineers', against the odds of a bewildering range of cultural differences.

To understand how engineers acquire 'qualities' in life that come to form an essential element of their agency in the profession ('their passion'), I propose to take a purely anthropological view on intense (life) experiences and re-visit the work of Victor Turner on rites of passage and liminality. The word 'qualities' is used in Turner's work to capture the mix of emotions, newly acquired insights and feelings of possibility that make an experience 'intense' and change the subject's position to act. Qualities refer partially to what is conceptualized in agency as habitus – as the acquired dispositions and habituated practices that inform the capabilities of an agent. As noted, in a study on masculinities it is important to grasp the (changing) relationship between agency and habitus – how subjects come to embody dispositions of manhood and habituated practices of gender discrimination – because this may tell us how norms of hegemonic masculinity are maintained, and how 'engineering cultures' and its 'masculinities' are sustained over time, across cultures and across borders.

It is *not* my intention to arrive at a cross-cultural, transcendental transitional experience that engineers undergo, but to theorize on some of the commonalities in intense experiences as described by irrigation engineers. To be clear, the type and location of intense experiences, and the activities, work experiences and achievements that are part of these experiences may differ across 'engineering cultures'. To illustrate, for DOI engineers, the college and the field can be identified as intense experiences in their lives, and for Dutch SNV engineers, this appears mainly to have been internships of study abroad and the field – not necessary the college or university (much like in my personal experience as a Dutch water professional in South Asia). For DOI engineers, the college experience is about staying in a student hostel (often abroad), participating in course work and competitive exams and getting a diploma; and the field experience is about working at remote project sites, doing actual design and construction supervision, negotiating with farmers and other 'stakeholders' and making a system work. In contrast, for (male) SNV engineers, the field experience was also importantly about living abroad for an extended period of time (sometimes with their wife or girlfriend).

The analysis here mainly builds on material from life history and open interviews with DOI engineers, and Dutch irrigation engineers that worked for SNV-Nepal in the late 1980s and early 1990s (see Chapter 1 for background information). I use the terms of communitas, catharsis and cathexis to conceptualize the commonalities in intense experiences of engineers. Some of these concepts are (also) used in Turner's work. Clearly both men and women undergo intense experiences in their life. However, I focus on the life history interviews of male engineers in this chapter. In the next one, I discuss the meaning of intense experiences for female engineers.

4.5.1 Revisiting Victor Turner's theory on rites of passage and liminality

Turner (1987) conceptualized rites of passage as transitional rituals that accompany changes of place, state, social position and age in a culture. For example, rites of passage are initiation rituals for boys to become men, or the communion of a boy and girl in marriage to become husband and wife. He explored the theory of the French folklorist Van Gennep (1908) who argued that rites of passage consist of three phases: (1) separation, (2) margin or limen, and (3) re-aggregation. The first phase detaches the ritual subject from its old place in society, the second phase changes and transforms the subject, and the third phase installs them in a new place in society (Turner and Turner, 1978: see p.249). Turner was particularly interested in liminality, the mid-transition phase of ritual passages, and what happened to people, the liminars, during the liminal period. Based on his anthropological work with the Ndembu tribe in Zambia, he observed that the liminal state was frequently likened by liminars – think of tribal boys who are taken deep into the forest for initiation rites – to death, to being in the womb, to invisibility, darkness, bisexuality, and the wilderness. He noticed that liminars become ambiguous, are stripped of status and authority, and are levelled to a homogeneous social state through discipline and ordeal. As explained earlier, Turner came to use liminality to conceptualize the subject in terms of *transition* and *potentiality*, as people having identities that change, altering through time and becoming somebody else.

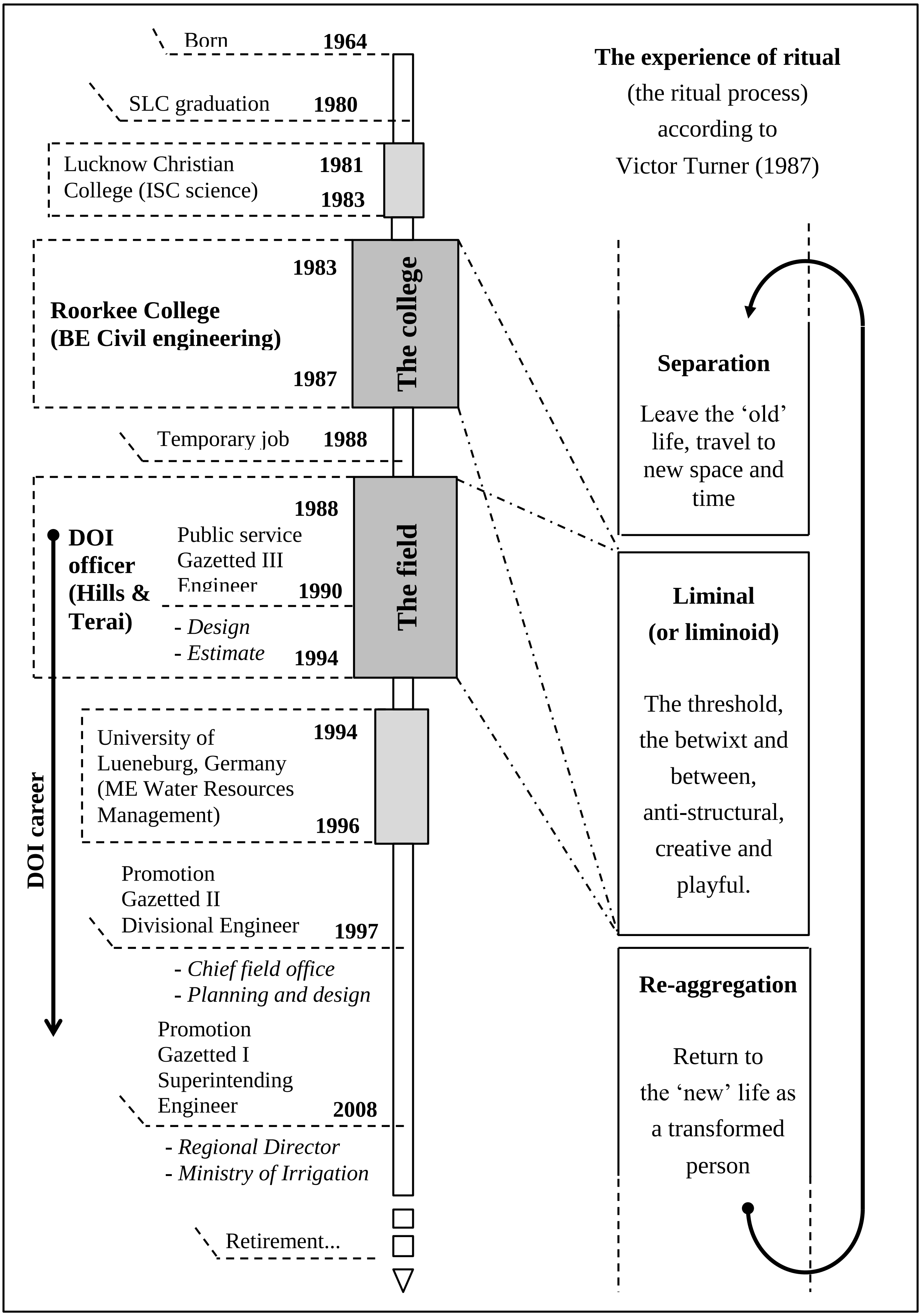
In a study on Christian pilgrimage in Europe, Turner and Turner (1978) coined the term liminoid to describe liminal phases in modern societies that were characterised by a progressive division of labour, such as exists in Nepal today. In tribal societies, rites of passage, like initiation rituals, tend to be compulsory for all members, and liminars, as a group or age cohort, would normally be taken away to a place set aside from villages, gardens and pastures of everyday use. Tribal sacra, and what the liminars have seen and learned, typically remain secret. In contrast, modern societies tend to generate special places for liminality, for example a church or shrine that openly exposes holy objects (or what is to be known), and the liminar has a virtual choice whether and when to participate in rituals. In modern societies, the subject for transition and potentiality is the individual, and no longer the group. Turner considered pilgrimage a liminoid or truncated liminal phase in Christians’ lives, because it has liminal characteristics – detachment from the old place in society, release from the ordinary structure, travel across boundaries, a journey full hardship, troubles and risks, initiatory aspects, simplicity of dress, homogenization, and eventually return to the old place as a changed person. Liminality, as liminoid for pilgrims, clearly resembles the experiences of DOI engineers when they were talking about the college and the field. They described these periods to me essentially as rites of passage that had changed them, and had awakened in them deep passions and a genuine desire.

Figure 4.1 presents the roadway of Mr. Mahesh Basu for becoming an Irrigation Engineer based on his curriculum vitae (CV). Born in 1964, in an high-class, upper-caste Bahun family with large land holdings in the Terai, Mr. Basu received good education. He obtained his SLC exam in 1980 and was send to a boarding school in India for higher secondary education. From 1983-1987 he went to Roorkee College (India) to obtain a bachelor degree in civil engineering. In 1990, Mr. Basu assumed service in the DOI as a gazetted third class officer, and he received promotions in 1997 and 2008. In 2011, he was assigned a new post as a Regional Director in one of the five Development Regions in Nepal, one of the key positions in the department. Mr. Basu had bright prospects to become the Director General of the DOI one day, and he can be considered one of the most successful professionals in the DOI.

Figure 4.1 demonstrates two things. First, it illustrates that lives and careers of engineers can be understood as a chain of liminoid phases, characterized by a continuous process of separation, liminality and re-aggregation. The college and field periods may stand out as the most significant experiences in the lives of DOI engineers but these certainly are not the only liminoid phases in lives of engineers. Mr. Basu also vividly described the period that he was sent to a boarding school as an 11-year old boy. He described that he was the only Parbatiya boy among Madhesi students and teachers, ended up in a hostel, cooked for himself and washed his own clothes while he had never done this before. He talked about this time as 'my hardship', and he explained that 'these two years made me very tough [and that] therefore, I can take any challenge (...)'. He described it as 'some sort of toughening' whereby 'I really learned a lot of things', qualifying his experience as a transition, as a 'main inspiration' and 'some sort of encouragement' in his life (MB Tape 1, 7:00 to 9:00 and 11:05 to 11:20).

Second, Figure 4.1 illustrates that the college and the field – and for that matter any other liminoid phase – only qualify as transitional experiences, and can only function as rites of passage, when all the 3 phases of a rite of passage are fulfilled. An experience is only liminoid when separation *and* re-aggregation occurs. Junior engineer need to live *through* the experience of the college and *through* the experience of the field to become an Irrigation Engineer of worth. To compare, Mr. Shankar Man Kumar Chhetri, a senior overseer in the DOI of about 50 years old, who was promoted to gazetted third class in 2010 after nearly 20 years of service, expressed his frustration about repeatedly being posted in remote districts (Doti, Okaldungha, Shankuwasara, Taplejung). He had entered the 'field' as a junior overseer but essentially had never left it, being denied the opportunity (by seniors) to undergo the field experience as a transitional experience. Over time, his passion had turned into frustration, no longer having the agency to perform up to the cultural and technical standard of a (senior) Irrigation Engineer. In case of Mr. Chhetri, the first years of field experience in the late 1980s can hardly be considered to have functioned as a rite of passage, because he was still dealing with the same activities and the same localities after 20 year of service. For junior engineers who aspire to become an Irrigation Engineer, getting out of the college and out of the field, is thus equally important or even more critical than getting into the college, and into the field.

Figure 4.1: Rites of passage for becoming an Irrigation Engineer



Source: Based on curriculum vitae of Mr. Mahesh Basu (2010) and Turner, 1987.

4.5.2 Communitas: Friendship and brotherhood among engineers

Turner used the concept of communitas to describe some of the qualities of transition that people undergo during liminal phases. He defined it as ‘a relational quality of full unmediated communication, even communion, between definite and determinate identities, which arises spontaneously in all kinds of groups, situations and circumstances’ (Turner and Turner, 1978: 250). He saw it as a liminal phenomenon (the location of communitas is in liminality, at the fringes of society, at the edges of structure) combining qualities of lowliness, sacredness, homogeneity, and comradeship; and he considered it as an essential and generic human bond (Turner, 2008 [1969]). Communitas is spontaneous, concrete and not abstract; and the bonds of communitas are undifferentiated, egalitarian, direct, non-rational, and existential. It is associated by liminars with universalism and openness, and characterized by pure possibility; it is considered real and part of ‘serious life’. Communitas does not merge identities, but it liberates them from conformity to general norms, though this is necessarily a transient condition in societies that continue to function orderly (Turner, 1974). It is a source of pure possibility, richly charged by pleasures, and those who experience communitas have a feeling of endless power. Guardians of structure often regard communitas as dangerous, and it may be hedged around with taboos and associated with ideas of purity and pollution.

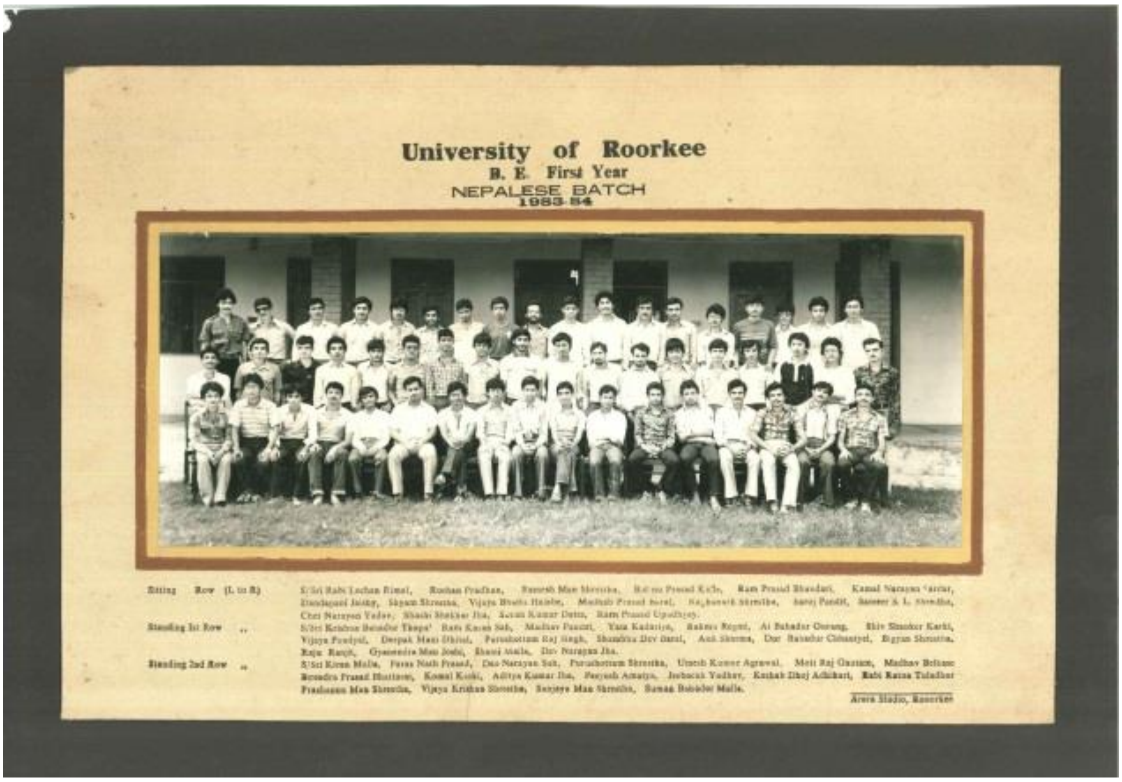
In these terms, communitas captures the qualities of experience that engineers described to me when they talked about the college and field years. In both periods, engineers were separated from the ordinary life and they travelled to new places, respectively to enclosed campuses and remote project sites. They described their experiences essentially as a journey that put them to the test. In relation to the college years for bachelor studies, DOI engineers described a process of homogenization, as being placed into a batch of students of the same age and gender (see Figure 4.2, photo 1), undergoing specialized training and being disciplined as responsible citizens for society. Mr. Basu recalled how he stayed in a separate hostel for Nepalese students at Roorkee college, kept aside from the Indian students. He explained that they worked late in the evening hours to get through their exams, and that students did not dare to take any action that might result in a lower mark for disciplinary behaviour (MB Tape 2, 31:00 to 38:50). Mr. Suresh Shajikali, who also went to Roorkee in the 1980s, vividly recalled how he shared a room with a fellow student in the first year, how he struggled to learn Hindi, and how students were expected to show disciplined behaviour in honour of the British legacy at Roorkee. He told that students were expected to eat three meals a day on straight laid-out tables using cutlery and serviettes, and he also remembered that students had to dress in a formal way, shirt buttoned, wearing shoes, no slippers allowed, and that they were expected to express courtesy in front of their teachers in a polite way (SS Tape 1, 48:50 to 53:45). Likewise, Mr. Nadir Amisan, a Madhesi accustomed to a diet of meat, remembered the physical discomfort that he experienced in getting accustomed to the vegetarian food at

Baroda University in India in the late 1950s; and how the Nepalese students initially had tried to cook for themselves (NA Tape 1, 27:00 to 27:30).

In some cases, but certainly not all, engineers mentioned initiatory or mass ragging rituals that marked their entry at engineering colleges as 'freshmen'. Nepalese students who went to Baroda University in India in the 1950s under the Colombo Plan or to Roorkee college in the 1980s under UN scholarships, never underwent this custom because they had a status as 'foreigners', but at other Indian and Nepalese engineering colleges, these practices went (and go) accompanied with a fair amount of ordeal, from bullying to following orders by senior students for public mass undressing, all with the objective of humiliation. Ragging rituals were often concluded with a big party, marking the membership of the freshmen in the college community and signalling that juniors could now rely on advice and guidance from senior students. In case engineers had undergone ragging rituals, at college or at high school, they spoke with warm feelings about this, as becoming part of a community, as juniors and seniors being connected. Likewise, the relations between students and teachers were also described with exceptionally warm words. Mr. Babu Krishna Paniya, a Roorkee student in the late 1950s under the Colombo Plan used the word 'affection', when he talked about the relation with his teachers. He described an atmosphere of confidence, trust and support, as in a situation of unconditional love (BKP Tape 1, 51:25 to 51:35).

Similar experiences were described in relation to the field, particularly among Dutch SNV engineers who had left the context of home and family in the Netherlands in exchange for a new life experience, and saw their mission in Nepal as an adventure. In the 1980s, Dutch SNV engineers in the Mechi project were relatively young engineers (between 25 and 35 years old), and they often described their experiences, after more than two decades, as the most memorable years in their career. They recalled deep pleasures and a sense of meaning, and talked passionately about the difficulties that they had encountered. Mr. Arno Smid recalled how he applied in 1987 as a young graduate for a SNV position in Nepal because the application mentioned 'hardship' conditions in reference to the required physical capacity to walk in the mountains. He felt that it would be a nice experience, and remembered how he followed language and introductory courses on the Nepalese culture with other young SNV engineers. He also explained about his difficulties in dealing with Nepalese counterpart engineers in relation to material supply and corruption, acting as a store manager rather than as a design engineer. Overall, he and other Dutch engineers described their experience as a 'dream job', as an intensive period in their lives, characterized by difficulties and acts of friendship, such as sharing *tonghba* (local brew) (see Figure 4.2, photo 2), playing *taas* (cards), or drinking *raksi* (liquor) with Nepalese engineers.

Figure 4.2: Communitas at the college and in the field



The first year batch of Nepalese students at Roorkee University, 1983-84. Obtained from private collection.

Dutch SNV engineers (and one female spouse) drinking *tongba* (local brew), Mechi project 1989-92. Obtained from private collection

Likewise, Mr. Bart Boom, SNV engineer for the Mechi project from 1988 to 1990, recalled his hardships with project implementation and the Nepalese bureaucracy, and did so while serving Nepalese food in the Netherlands, inviting me to eat with my hands as in Nepal. All this revealed a strong connection with his memories of Nepal. Engineer Mr. Joep Klein and socio-economist Mrs. Wendy Vroeg recalled in a joint interview that the boundaries between the personal and the professional were blurred in the Mechi project, because SNV staff had to rely on each other as friends, and relationships developed between Dutch male and female SNV project staff, and between Dutch SNV male staff and Nepalese women. This made the atmosphere relaxed and tense at the same time, contributing to the intensity of their experience in Nepal. They also described the shared ideals of SNV staff, building infrastructure, fighting poverty, and people's empowerment; ideals associated with the development discourse that prevailed in the West in the 1970s and 80s, and an atmosphere that was characterized by a taboo on luxury products and a distaste for (official) authorities.

The effect of communitas is a deeply shared feeling of brotherhood or connectedness (for life). The knowledge that one has undergone the same hardship and though experience creates a bond of comradeship and recognition, even among engineers that have not directly shared this period together. Communitas at the college and in the field can be considered a form of acquired dispositions that enables individual engineers from diverse national and international backgrounds to behave as members of a relatively coherent group, and invokes in them a desire of belonging that crosses national, organizational and generational boundaries. Mr. Basu described this feeling when he started employment around 1990 for the DOI, he noted that '[senior engineers] were not a part (...) of [the] general community, they thought themselves to be very special people (...), they were engineering so there was some sort of speciality [about them]' (MB Tape 4, 27:00 to 27:20). Communitas re-connects the before and after periods of liminal phases into a new coherent life experience. In telling stories about his life – not just about the college and the field – Mr. Basu referred consistently to the plural 'we' rather than 'I', connecting events at various stages in his life into one coherent and seemingly natural experience that is shared among engineers. He recalled in relation to his science teacher, when he was a young boy, how 'we used to go to his house [for study], he was just like our brother', than jumping to Roorkee where this teacher was a student two years senior to him, explaining that 'there he was also our *gyanji* [elderly brother or mentor]', and then describing that 'still I call him brother' (MB Tape 1, 13:50-15:45). These quotes illustrate that it is bonds of comradeship, being one among others and part of bigger whole, that characterizes the transitional experience of communitas.

4.5.3 Catharsis: Emotional transition of the self

For understanding processes of emotional transition during liminal phases, and how intense emotions invoke passion in liminars, I use the concept of catharsis, taking inspiration from dramatic arts and how the term is used to describe the effect of tragedy on the audience – as a process of emotional purification or correction (Boal, 2002 [1974]). Catharsis can be considered to accompany communitas and is an extreme change in emotion or in self-perception that results in the renewal and revitalization of the 'new' self. In his critique on the working of classical Aristotelian tragedy, and how it relates to subordination in society, Boal defines the provocation of catharsis as the principle aim of tragedy. It constitutes the climax in drama play, and is about the presentation of the error of weakness of the main character, with the effect that the audience is purified emotionally and the spectators' soul is made free of the eliminated extraneous matter. As a medical metaphor, catharsis denotes the pathological effect on the soul, analogous to the effect of medicine on the body, correcting a person's 'erroneous' weaknesses such as pride, haughtiness and unilateralness. As can be surmised, for Boal, a Brazilian activist who was deeply involved in the 1970s in resistance movements against dictatorship in Brazil, catharsis takes away from the character the ability to act – and therefore the spectators' agentival capacity to act – because it is precisely these characteristics that are conducive to attitudes favourable to social change. However, as discussed above, agency is more than resistance, and catharsis can also empower a character with a new (public) identity, with the capacity to assume a new position as an engineer in the COP of the Irrigation Organization, 'properly' changed and 'free' of undesirable thoughts.

Catharsis – as the correction of human's errors and the emotional purification of the subject – links spectators to heroes, students to teachers, and junior engineers to senior engineers. In this view, metaphorically speaking, engineering education and the first work experiences in the field function as the medicine that turn 'erroneous', 'polluted' and undisciplined pupils into 'cleansed', focussed and passionate engineers. Such an understanding of catharsis matches with some of the experiences of engineers during the college and field years. In regard to the college years, DOI engineers spoke at length about the quality of education (the medicine), and how teachers were an example for them (the heroes), *and* how this had (emotionally) cleaned and changed them. DOI engineers described feelings of power, and being part of a larger project in society, being one with the global cause and the universe. They described sentiments that resemble feelings of emotional purification; being liberated, feelings of an endless stream of possibility, made possible by education and teachers. The following quote of Mr. Paniya captures some of these sentiments and gives an idea of the effect of emotional purification that he has undergone, as a process of focussing and cleansing: 'what I think is that if you really do something for the country, it is always good (...), I have always found that [when] you make a determination, then [show] dedication, [when] you [have] perseverance [and] patience, you can do anything, you can accomplish anything, there is (...) nothing in the world that can stop you' (BKP, Tape 3, 14:10-15:20).

Mr. Basu recalled the 'simplicity of the professors' and that it had deeply impressed him. He explained that the professors did not have a lifestyle that normally was expected for such men, and that they rejected the luxury and pleasures of the ordinary world. They lived with their families in quarters provided by the university. Most of them did not have any cars and came to class by cycle. Mr. Basu explained that 'it is really inspiring [what these] professors are doing (...), how they are serving their nations, and even the whole academic aspect [related to] the whole world, I would say, they are really good examples' (MB, Tape 2, 1:05:40 to 1:07:40). Mr. Saroj Bam Upreti, a graduate of Baroda University in the 1950s, recalled that the engineer embodied a completely new public identity in Nepal in the 1950s and 60s. He elaborated that he wanted to become an engineer against the wishes of his father who had been an administrator under the Ranas, because an 'engineer (...) can [work] anywhere in any country [and is] independent [from the government administration]' (SBU, Tape 2, 35:00 to 35:50). These quotes suggest that the experience of the college, in different times and in different localities, touches students at deep emotional levels, changing them into engineers with a new identity, 'free' of an unneeded and inessential desire such as a longing for administrative politics or material benefit as exemplified by the hero-teachers at Roorkee.

4.5.4 Cathexis: Confirmation or re-aligning of passion into objects or persons

I use cathexis here to highlight processes of investment that liminars undergo in fixing or re-aligning mental or emotional energy in a person or idea, like the term is known in psychoanalysis to describe the development of libido or sex drive (Connell, 2005 [1995]: 74). In reference to liminality, Turner and Turner (1978) mention the term 'cathected' for a process of bonding. I find the term useful to understand how young engineers develop agency through the fixing of desire and passions upon objects and persons, in other words, how liminars re-attach or learn to love the object of technology and learn to display a (compulsory) hetero-normative sexual desire. Here, similarities in the experience of Nepalese and Western engineers, in this case Dutch SNV engineers, are most clearly visible. Both Nepalese and Dutch engineers shared stories that reveal a deep passion for, and identification with technical knowledge, construction work, and hard (and big) irrigation objects. If these passions did not surface immediately in interviews, than they were clearly visible on old project photos, mostly displaying structures and occasionally, engineers near or on top of irrigation structures (see Figure 4.3 for photos of the Mechi project). They were also revealed in the way field visits were conducted. The focus was always on visiting the infrastructure and 'hardware'.

The college years and the field appear critical stages in the lives of engineers for the fixing or re-aligning of passions onto objects and persons, and respondents often spent considerable time explaining the details of a particular design, the value of a certain book or the deeds of a renowned engineer. Mr. Shajikali explained that every Roorkee student learned about Sir Proby Cautley, the British (hero) engineer who built the 500 km long Ganges canal in India between 1842 and 1854. Mr. Basu spoke devotedly about some of the books that his teachers had written. Passionately, he showed to me during the interview a very used book of Mr. Bharat Singh about the fundamentals of irrigation engineering. He told me that 'it is not possible that an irrigation engineer in Nepal does not have this book', and iterated that 'each of the lines of this book [have] been read by most (…) of the engineers in Nepal'. He explained that 'it was probably the oldest irrigation engineering book in India, and our engineers who studied in India (...), they must have this book; and all our irrigation head works, [and] designs [are] textbook cop[ies] of this [book]'. He continued by saying that 'there are really special formulas which you will not find in any [other] books'. He joyfully pointed out, by opening the book, 'chapter 4: sediment transport and design of stable channel alluvium', and explained that 'this concept is completely new, of course there is some science (…), but most of it is empirical things'. In a similar way, he mentioned a book about structural engineering written by Mr. O.P. Jen (MB Tape 2, 49:45 to 52:30).

Figure 4.3: Cathexis – assigning mental or emotional energy onto objects

A newly constructed canal in the Mechi project (± 1990). Obtained from private collection

SNV engineer posing on top of a drop structure in the Mechi project (±1989). Obtained from private collection.

In regard to the first years of field experience, Mr. Basu enthusiastically explained to me the technical intricacies of the torrential bottom intake (or Tyrolean weir), a structure that is particularly suitable for turbulent mountain streams (MB Tape 3, 1:08:00 to 1:09:00). Mr. Paniya also talked about the Tyrolean weir (BKP, Tape 3, 19:15 to 22:40), as well as about Mr. Gerald Lacey, a British engineer who worked with the Punjab Irrigation Department and developed the regime theory for stable canal flow (BKP, Tape 1, 44:15 to 46:15). Mr. Upreti explained in detail about river training works (SBU, Tape 3, 8:30 to 12:30). Also Dutch SNV engineers mixed stories about Nepal and their lives with explanations about the designs of irrigation structures such as break pressure tanks and methods for stone masonry. The dramatic effect of such accounts is a coherent popular image in which a passion for structures shows as the natural desire of engineers. Mr. Shajikali aware of this, noted that young DOI engineers in the field are 'introduced into [the] charm of construction work', referring to possibilities of rent-seeking and also to a professional orientation to be passionate about (SS, Tape 3, 7:20-8:10). These accounts reveal how engineers develop an experience of self, and how engineering passions and desire become part of their personality. How deep this goes, is illustrated with a quote of Mr. Amisan, explaining why geometrically designed, trapezoidal canal are simply more beautiful than *kulos* (indigenous canals): 'that I can say [for] myself, if I [ride] on [a] cycle (...) and if the canal is running with water and having falls and that, you [feel] pleasure in (...) cycling on the side of the service road, if it [is] a bigger canal comparatively, but if it is a *kulo*, you cannot try [cycling]' (NA, Tape 1, 50:20-50:55).

Interviews and conversations with Nepalese and Dutch engineers provide for some suggestions that there also occurs a fixing or re-aligning of (compulsory) heterosexual desires among engineers during the liminal phases of the college and the field. Straightforward examples are difficult to give, because the categories of 'homosexual' and 'heterosexual' as commonly understood in the West are problematic for the Nepalese context, as noted in Chapter 1. There only was one Nepalese engineer who displayed a strong homophobic attitude in interviews by denouncing the political recognition of gay behaviour in Nepal as a human right (BKP, Tape 3, 1:24:00 to 1:25:30). In the West, this attitude can be considered exemplary for the masculinity of engineering cultures (Faulkner, 2009a; 2009b), but in this case, it was unclear whether the engineer really disliked homosexual behaviour – in whatever way he understood it – or aimed to address, in his eyes, the arbitrary attitude of Nepalese party politicians in adopting international discourses in the name of democracy and progress.

Circumstances for a 'wandering hand' certainly appear to exist in hostels at engineering colleges and in lodges near or at project locations in the field. Here, students and engineers often share rooms and beds with the same sex. One Dutch male SNV engineer shared with me in confidence such an experience about his work in the early 1990s in Chitwan District under an irrigation rehabilitation project of a Nepalese government organisation. He explained that he worked intensively with a couple of young and mostly unmarried Nepalese overseers in the field, had drinks together, went to the cinema, and sometimes (had to) share a room with his Nepalese colleagues for staying overnight at a project site. Here, at one such occasion, he encountered what might be described as a wandering hand. He recalled that he disliked it and refused to go along in the act. He explained his reaction by saying that he associated his experience with homosexual behaviour. Personally, I did not undergo such an experience, but I ended up sharing rooms with Nepalese men in government lodges, houses and hotels on my travels in Nepal. The practice of sharing places for sleeping among men is the norm in Nepal, and there is basically no shame and dishonour for the family in acts of *maasti* as long as this behaviour remains playful and unremarked.

4.6 Conclusions

This chapter has further investigated the assertion that irrigation engineering and masculinities co-define each other, based on an analysis how young engineers are disciplined and included in the DOI through processes of self-normalization and transitional performance. It has been argued and shown that participation in the informal milieu of engineering institutions – notably in the colleges and in the DOI – is critical for young engineers to become a 'real' Irrigation Engineer, because 'engineering' is a social process – a system of communication, exchange and interaction. Obtaining an engineering degree, being a member of an engineering association and getting employed in the DOI, are themselves not acts that bestow on young engineers the status and credibility of a 'real' Irrigation Engineer. For this, young engineers, both male and female, need to participate in the informal milieu and must learn or 'be taught', how to perform up to the standard of the Irrigation Engineer, technically and culturally.

It has been shown that the informal milieu in the DOI is not a level playing field. The professional sphere of the DOI is embedded in the local sociocultural system and the informal milieu is infiltrated by gender stereotypes and cultural norms that prevail in the family-society sphere, influencing the behaviour of male and female engineers, and the interactions between them. In fact, it can be seen that the informal milieus of colleges and the DOI function as sites for performing masculinities both in professional and family-society spheres, because engineering institutions are examples of places in Nepalese society where the inclusion and disciplining of members in the COP of the National Elite is regulated. The 'masculinity' of the Irrigation Engineer needs thus to be understood as part of society and how high-class, upper-caste masculinities and femininities are performed in Nepal. The 'typical' Irrigation Engineer comes from middle and high-class, upper-caste (Hindu) families that practice a strict division of labour and follow traditional role patterns in the joint family. Young boys from these households are inspired by male members from the family and peer group, to pursue the most prestigious education – science and engineering studies. They go to an engineering college, secure employment, get married and become an Irrigation Engineer, and a man of worth in the COP of the National Elite; and in their turn, they encourage their boy children to do engineering studies and pursue a professional career. In contrast, in the patrifocal kinship structure of the family-society sphere in Nepal, a young girl is encouraged to become a 'good' woman, and aspire to nurture 'her' husband and 'his' children within 'her' new joint family. In case women have been encouraged to follow higher (engineering) education, the goal is to become 'independent', and secure bright marriage prospects. Once they are married however, they are expected to observe the family sphere regardless of their education qualifications and career prospects. The stereotypical profiles for elite men and women, based on the responses of the questionnaire, clearly show that these social norms structure the informal milieu *at the group level* and influence the perceptions of male and female DOI engineers.

For young engineers, the social norms and perceptions that structure the informal milieu of engineering institutions constitute a formidable barrier for getting integrated in the DOI and in its different projects. For junior male engineers, the expectations of family and peers are high and competition among men is strong, they need to become 'real' men and learn how to behave as an Irrigation Engineer. For junior female engineers, the expectations of family and peers also are high but very different, they need to become 'good' women and have to learn how to perform as a DOI official without compromising their performance of chastity, obedience, domesticity and adaptability – the characteristics of a performance of femininity. For female engineers, the informal milieu constitutes thus a particularly strong challenge. Female engineers in the DOI need to negotiate their time carefully in the family sphere and in the professional sphere, while men have ample opportunities to develop a career. For female engineers, it is much more difficult than for their male counterparts, to perform up to social norms in the informal milieu and to develop a personality that is associated with the Irrigation Engineer. It is clear that both men and women are 'subjectivated' in the DOI, but the genderedness of the informal milieu appears to produce particularly paradoxical situations for female engineers. This issue is investigated further in Chapter 5.

This chapter has tested a novel approach to lay bare the construction of desire in normal professionalism in irrigation. I used the performativity of a questionnaire to interpret how the ranking of acknowledged irrigation tasks and priorities can be understood as acts of engineers to remain accountable to knowledge claims in the engineering profession – as acts of agency in developing an experience of self as an Irrigation Engineer. A general belief in meritocracy and impartiality among engineers may mask this practice and hide that irrigation tasks and priorities are socially constructed, but I have shown through the questionnaire that a display of 'proper' desire – being aware and passionate about the normative irrigation tasks and priorities in the ranking – is more or less directly related to career opportunities and roadways of success. The filling in of the questionnaire itself reveals basically a process of self-normalization and it is here that we can see the relation between agency and professional identities in irrigation. In awarding stated irrigation tasks a high priority in the ranking, respondents seek to present themselves as a 'real' Irrigation Engineer, as a person who is passionate about 'system construction' and 'water use efficiency' – an act that gives agency in the informal milieu of the DOI. Evidently, filling in a questionnaire itself – seen as an act of paper work by engineers – is not enough for displaying a desire to become a 'real' Irrigation Engineer. For this, young engineers need to engage themselves in specific activities and they have to master particular knowledge, skills and attitudes, depending on the phase in their career (junior, middle-aged, senior). In listing the normative activities, knowledge, skills and attitudes, it becomes clear that desire and pleasures in irrigation in relation to these 'career requirements' can be seen as gendered. I have shown that male and female engineers produce similar rankings – they want the same stuff – but also, that legitimate peripheral activities for becoming an Irrigation Engineer are seen as legitimate mainly for male engineers.

Like participation in the informal milieu of the DOI, the filling in (and the performativity) of the questionnaire is essentially an example how the voluntarily reproduction of everyday habits of knowledge and perceptions in engineering, results into the production of unequal gender relations. As noted, male and female engineers generally produced similar rankings in the questionnaire, revealing a shared desire among male and female engineers to get involved in project implementation and construction supervision, but it also showed slight variations. Female engineers also appear to seek meaning in what are considered 'secondary' irrigation tasks in the DOI such as 'cooperation with other departments'. This phenomenon can only be explained by recognizing that legitimate peripheral activities on the roadway for becoming an Irrigation Engineer, are not equally considered legitimate for male and female engineers.

The method of using a questionnaire here is not without problems. As noted, the challenge lies in the construction of a questionnaire and to 'validate' it, i.e. to make sure that it measures what it is meant to measure. I have already reflected on gender biases in the questionnaire (see above) but there also are professional biases. As noted, I compiled the lists of irrigation tasks and irrigation priorities myself, based on my own education and experience as an irrigation professional. In short, the questionnaire brings into existence a particular reality of experience and it may thus not show the tasks and priorities that DOI engineers really consider important, for the simple reason that these were not pre-defined in the questionnaire. Another (serious) limitation in the method of analysis, as already mentioned, is the application of a (deliberate) blind eye for project and time bound contexts in the interpretation of the questionnaire.

The latter should also be seen as a concern for further research in an analysis of transitional performance. Taken together, the work of Victor Turner and the concepts of communitas, catharsis and cathexis capture, in theory, how intense experiences in life and in careers (can) function as rites of passage on the roadway for becoming an Irrigation Engineer. The strength of an anthropological perspective on the meaning of intense experiences is that it allows to conceptualize how genuine passions for belonging are awakened in young engineers and how a deep desire for acts that reproduce dominant culture are invoked in them. To recapture with an example: the experience of communitas of a young male engineer in the college or in the field, goes inseparably together with 'his' renewal as a man among senior engineers (catharsis), and with practices that conform desire onto technical objects and that re-align (sexual) passions based a normative culture of compulsory heterosexuality (cathexis). Transitional performance also offers a theory how Nepalese and Western engineers meet as members in the COP of the Irrigation Organization. By undergoing similar rites of passage, in this case 'the field' in its various meanings, DOI engineers and SNV engineers came to share a passion for irrigation engineering and developed a sense of belonging 'as men' and 'as engineers' regardless of cultural differences and specific norms of manhood.

These reflections and limitations in the approach having been noted, the analysis on self-normalization and transitional performance in irrigation engineering, and how it relates to masculinities, is useful because it explores new perspectives on the 'socialization of engineers' in the profession as it is known now for some time. By locating processes of socialization in the informal milieu of engineering institutions, rather than in the content of engineering courses or in modes of irrigation project implementation, and by acknowledging that the informal milieu is influenced by cultural norms in the society, it becomes clear from the onset that processes of self-normalization and transitional performance in engineering function *de facto* as structures of discrimination and institutional sexism – in favour of (some) men and against (most) women. In short, it opens up a much needed perspective to scrutinize masculinities in the socialization of engineers in the irrigation profession.

Chapter 5:

The performance of “lady engineers” and “other men” in the DOI

5.1 Introduction

This chapter investigates the position of female engineers in the DOI, known in the department as ‘lady engineers’. I also reflect briefly on the position of ‘other men’ in the DOI, defined broadly as not-being-an-Irrigation Engineer, from male professionals in the DOI other than civil or agricultural engineers, to men of ‘lower’ caste and ethnic minorities. Building on the previous two chapters, this chapter presents a last (and concluding) analysis on the roadway for becoming an Irrigation Engineer. To recall, the goal is to understand how masculinities in irrigation professionalism are sustained through the inclusion and disciplining of young professionals in the COP of the Irrigation Organisation, taking the performance of the Irrigation Engineer as a case of study. By focussing on the performance of lady engineers in the DOI, whose position is conceptualized as the view of the ‘excluded’ and ‘from below’, it might be possible to expose in more detail, how masculinities ‘stick’ to the Irrigation Engineer and to reveal how masculinities in the DOI function as a practice of discrimination and institutional sexism to the advantage of (some) male members in the COP of the National Elite and at the expense of (most) female members in this COP *and* non-members (men and women of ‘low caste’ and ethnic minorities). The analysis in this chapter is meant to provoke a discussion on the liberal and progressive idea that everyone can and is entitled to become an Irrigation Engineer. It also aims to unsettle the idea that emancipation and gender equity come with time, as a trickledown effect of education, progress and modernization. This assumption is widely shared by engineers, development practitioners and academia who believe in meritocracy and the impartiality of science and technology, both in South Asia and in the West (Gupta, 2007; Lebbink *et al*., 2013). However, as shown in Chapter 3 and 4, practices of (gendered) exclusion at the professional level in the engineering institutions in Nepal have taken many shapes in the past six decades and they are actively cultivated, and therefore it seems, they are unlikely to disappear.

The problem of female underrepresentation in (irrigation) engineering has become more acute and contested. Employment prospects in the engineering sector in South Asia have never been very encouraging for women professionals (ERA, 1973; HMG-N/Winrock, 1980; WECS, 1984; DHV/APROSC/WB, 1989; WECS/CIDA, 1991; WECS/BCESC, 1996; Gupta, 2007; SaciWaters, 2011). In Nepal, as in India, there has been a fifty fold increase in engineering education in the last six decades (see Chapter 3), and the 10% quota for women students at the IOE (engineering), IAAS (agriculture) and Institute of Forestry (IOF) in Nepal, often left unused in the 1980s, have been filled annually since the 1990s (Adhikary, 1995). For the last two decades, there has thus been a small but steady production of female engineering graduates, but they have hardly entered employment like their male counterparts. In the 1990s, women were reported in Nepal to constitute just 8% of the work force in the agricultural and natural resources management sector, covering the civil service, NGOs, INGOs and the private sector (Adhikary, 1995), compared to just 12% of the staff in the civil service in 2011, and only 3% in the engineering service of the public administration (see Chapter 3). This situation is not much different in India. In spite of a high number of meritorious women in engineering studies, women constituted just 8% of the workforce in science and technology in 2002 (Gupta, 2007), and there has been reported an unemployment rate for women engineers in India of 55% compared to an estimated 15% to 20% among men (Parikh and Sukhatme, 2004). These figures *do not show* a progressive development of women’s emancipation, not even among the elite, and they illustrate an increasingly contested underrepresentation of women professionals in engineering (see Nair, 2012 for India).

So far, the analysis in Chapter 3 and 4 has mainly focussed on gender differences between men and women – not on the differences among men or among women. The reason is simple: the ‘absence’ of female engineers in the DOI – and in the COP of the Irrigation Organisation at large – is the most visible marker of a resilient culture of masculinity, easy to observe and ‘measure’. However, in a study in irrigation on masculinities, it is important to acknowledge that ‘most’ exclusion in the COP of the Irrigation Organisation – as exemplified by the case of the DOI – is practiced among men, between foreign experts and Nepalese engineers, and among Nepalese men based on intersections of class, caste, ethnicity, nationality, education discipline and institutional affiliation. To recall, the civil service in Nepal and the engineering institutions on the roadway for becoming an Irrigation Engineer, have been shown in Chapter 2 and 3, to function as closed class and caste institutions for members in the COP of the National Elite at the expense of people of ‘lower caste’ and religious and ethnic minorities (‘untouchable’, Janajati, Muslims: see Chapter 1 for these categories). In short, three ‘levels of exclusion’ can be identified in public institutions in Nepal. First, at the symbolic level, public institutions are places for the cultivation of national identity, ‘to keep the Indians out’. Second, education and employment in public institutions have traditionally been controlled by the elite, ‘to keep low-class, lower-caste and ethnic people out’; and third, education and employment in public institutions are traditionally considered the privilege of (elite) men, ‘to keep women out’ (cf. Gellner *et al.*, 2008 [1997]: 449). All these levels of exclusion can be seen to intersect with gender, particularly in relation to the performance of Elite Manhood – the norm of being an honourable man in the COP of the National Elite (see Chapter 1).

Levels of exclusion can also be identified among foreign experts and Nepalese professionals in the COP of the Irrigation Organisation, in the context of development aid. Those from the

West, particularly 'white' and 'tall', senior male experts, appear to have the highest status, embodying Western hegemonic norms of progress (and masculinity), followed by men from 'big brother' India, and professionals from Asia and Nepal. Apart from nationality, discrimination and exclusion in the COP of the Irrigation Organisation occurs through the intersections of educational discipline and institutional affiliation. This can be illustrated with the performance of the 'agricultural engineer' in Nepal. As said, I interviewed Mr. Huta Ram Baidya, known as the 'first agricultural engineer of Nepal' and famous for his advocacy on the 'Bagmati civilization' (the Bagmati is seen as the holy river in the Kathmandu valley: see Rademacher, 2007 for background). He started his career in 1947 in an organisation that would become the DA in Nepal. As an agricultural engineer in the DA (1947-1961), he built a career in rural development and agricultural extension, also working on irrigation in this period (Baidya, 1968).[28] In my talks with him on the position of engineers in irrigation, he repeatedly made a sharp distinction between (civil) engineers who work with lifeless material (concrete, bricks, steel) and the living environment (plants, animals, humans), emphasizing that he is an 'agricultural engineer' (HRM Tape 12, 30:49). In short, he did not see himself as a member in the COP of the Irrigation Organisation and he associated himself (mainly) with agriculturalists and rural development specialists – not with the performance of the Irrigation Engineer. For members in the COP of the Irrigation Organisation, he can be seen to belong to 'other men' although he shared with me in-depth knowledge on irrigation.

The position of the agricultural engineer is interesting, because agricultural engineers in the DOI do perform as an Irrigation Engineer (see also Chapter 1). They are involved in the same project activities as civil engineers (survey, design, construction supervision, monitoring and evaluation) and take up high management positions in the DOI (up to gazetted first class positions), and not just in irrigation management divisions. As can be surmised, the intersection of institutional affiliation in relation to educational discipline is critical here.

Apart from these introductory reflections, the remaining chapter focusses on female engineers in the DOI. As noted, their 'marginalized' position is highly visible in the DOI whereas subordinated positions among men in the organisation are more difficult to detect, at least for me as a researcher with an outsider position. Apart from the presence of (male) Madhesi officers, class and caste issues (among men) are difficult to understand 'within' the DOI, because class and caste discrimination largely takes place 'outside' the DOI – only 2% of staff in the lower management positions in the DOI had a Dalit background (DOI, 2008; see also Chapter 3). Furthermore, I learned that it is more difficult to discuss issues of professional culture and masculinities with male engineers than with female engineers in the DOI. This may have been the result of 'my' performance and 'my' methods of questioning,

[28] A full life history of Mr. Huta Ram Baidya has been written, but not included in this thesis.

but it also appears to be the case more generally. SaciWaters (2011) reports that senior officers in the water bureaucracy in India were reluctant to cooperate with the facilitation of interviews for a situational analysis of women water professionals in South Asia, because they saw no use for such a study (p.63). This situation is problematic because it can be expected that exclusion between men and women intersects with exclusion among men. In this chapter, I circumvent this problem by assuming that dynamics of exclusion between women and men are the same as among men, but this surely is an issue for further research. Analysing the performance of (male) Madhesi engineers in the DOI would provide for a useful entry point of research.

The chapter proceeds by presenting entry points of analysis. Then it continues with a brief explanation of the organisation of a workshop with 15 female officers and engineers in the DOI, which, together with the questionnaire (see Chapter 4) is the material for the argument in this chapter. Then the analysis is presented and the chapter finalizes with conclusions.

5.2 Entry points of analysis

The preparatory work for this chapter has been a critical reflection on the narrative that the emergence of women professionals in irrigation is a ‘recent phenomenon’. The historical analysis on the position of women professionals in Nepal has shown that Nepalese women professionals have always existed in rural development alongside male professionals, as home scientists, as JTAs in agriculture and as community specialists, and sometimes also as engineers (see Chapter 2). Yet, there is a persistent and popular belief in Nepal that female engineers are something ‘new’. Illustratively, the respondents of the questionnaire, both male and female engineers, saw the entry of ‘lady engineers’ in the DOI as a new development. However, already twenty years ago, WECS/CIDA (1991) reported that ‘the emergenc[e] of ‘hard core’ career-oriented professional women is a recent phenomenon [in Nepal]’ (p.24). In fact, (some) women professionals in Nepal have always pursued employment in technical professions (Shrestha, 2007), but they have not made promotion, dropped out or switched job after a number of years. In this regard, WECS/BSESC (1996) rightly noted that ‘a significant proportion of women officers (65 per cent) [in the water and energy sector in Nepal] is found to have less than 6 years of experience’ (p.19), and reported that around 66% of the total women employees in the sector eligible for promotion had not received any promotion opportunities since their entry in service. Also Adhikary (1995) mentioned that most women professionals in the agricultural and natural resources management sector in Nepal had less than 6 years of work experience, and noted that experienced women professionals often switched jobs after 10 years.[29] This situation, then and now, is not unique for Nepal – it prevails in South Asia. In Bangladesh, most female engineers in the water sector are currently young professionals between 26 and 35 years old (SaciWaters, 2011), and the same document

[29] Adhikary (1995) does not mention the jobs that these women professionals went to.

notes that there is a '*consistently* low number of women water professionals employed across the [public water] agencies studied [in South Asia]' (emphasis added) (p.148).

The view of women-in-engineering-are-new does give credit to the reality that more girls have enrolled for engineering studies in Nepal during the last two decades (see Chapter 3), and that engineering in South Asia also is now a profession considered suitable for girls (see Nair, 2012 for India). Affirmative action and gender policies do not seem to have played a role in this (see Chapter 2 for analysis). The 'feminization of engineering' is mainly related to globalization and market forces (see Gupta, 2007 for India), which have resulted in a decline in status of engineering studies, marked by the entry of women engineers in the profession. Adhikary (1995) already reported that Kathmandu-based students saw engineering as a 'distress option', based on their failure to secure admission to more desirable fields of study (p.36). Also Udas (2011) reports that the subsidized fee structure of the government – making public education nowadays about 10 times cheaper than at private colleges – is an important factor for parents to encourage their girls for engineering education (p.125). The increasing number of women engineers in Nepal appears thus directly related to the social status and decline of the profession, a development that is not unambiguously positive for gender equality. Based on these developments, I have formulated four analytical entry points:

The first entry point is to assess the awareness *among engineers* in the DOI about masculinity, based on the questionnaire answers and the meeting with women officers. The goal is to investigate (a) whether male and female officers share an awareness on the normative professional culture in the DOI, (b) whether they qualify that culture as masculine, and (c) to assess their opinion on the (changing) culture in the DOI in relation to their professional performance. These questions allow to assess the actions that female officers seek to pursue and to scrutinize the progressive idea that women professionals, by means of their subject position as women, can or are willing to perform as 'agents of change' (WECS/CIDA, 1991: 25) and 'gender benders' (Nair, 2012). This view has underpinned, for instance, the Dutch funded 'Crossing Boundaries' project (2006-2011) in South Asia that focussed on long term education efforts of women students, and teaching the skills of interdisciplinary knowledge and practice, with the goal to produce a sustained change of professional policy and practice in the water sector (SaciWaters, 2011). More specifically, with the (formal) education and inclusion of (more) women and interdisciplinary trained professionals in water management, it was expected that the culture of irrigation professionalism in South Asia would become more gender-sensitive, or rather 'less masculine', and markedly more appreciative towards integrated water resources management solutions. A discussion on the subject position of women officers in the DOI, as potential gender benders, and their presence in 'numbers' in relation to visibility and critical mass (Gupta, 2007), is pursued in the conclusions.

The second entry point is to analyse how women professionals deal with, and undergo, self-normalization and transitional performance. As discussed in Chapter 3 and 4, engineering is considered a male domain in Nepal and the roadway for becoming an Irrigation Engineer is governed by the 'masculinity' of the informal milieu at engineering institutions, posing (additional) barriers for women to perform as engineers. Gupta (2007) talks in this context about 'invisible obstacles' as social stereotypes and cultural specific norms in engineering organizations (p.508) (see Chapter 4 for the social stereotypes and cultural norms in Nepal). Occasionally, invisible obstacles have been noted in reports on the role women in the water sector. WECS/CIDA (1991) mentioned attempts to 'degrade, disobey and harass the [female] professional because she is a woman' (p.26), quoting a woman engineer telling about 'some dark sides' in her professional experience (p.27). SaciWaters (2011) notes that women water professionals have limited access to casual discussions, often lack an informal group of friends (colleagues and seniors) for seeking support and are not expected to be corrupt and bribe. In the college and in the field – two experiences that function as rites of passage for becoming an Irrigation Engineer (see Chapter 4) – girls often refrain from taking initiative, and are kept aside in separate hostels and tents during excursions (see Nair, 2012 for India)

The third entry point focusses on the biggest taboo for women professionals in engineering – working 'in the field'. More than any other argument, the supposed 'inability' of women engineers to work in the field is used to legitimize the absence of women professionals in irrigation – end of story. In a report on career prospects of female graduates in Nepal, Adhikary (1995) noted that 'field work is not considered a respectable job for profession [by educated women]' (p.37). Also SaciWaters (2011) mentions that it is considered socially inappropriate for educated women to travel, stay overnight and take residence in rural areas. This issue deserves scrutiny because the undertaking of field work at the beginning of the career is a critical step for becoming a 'real' engineer (see Chapter 4), and the Irrigation Engineer is defined by 'his' capacity to undertake project work at the site.

The last entry point is an inventory of the barriers for women engineers on the roadway for becoming an Irrigation Engineer. Gupta (2007) argues that women scientists and engineers face a subtle 'accumulation of disadvantages' which results in a 'deficit of social capital' (p.524). The focus is on 'typical' disadvantages that women engineers in the DOI may encounter in their careers. Based on the group discussion with female officers and engineers in the DOI, it also is investigated how the disadvantages shape the career path of women professionals and at what point they result in 'career plateaux', defined broadly as losing the prospect for promotion, unable to secure attractive postings, being tied to secondary jobs in the organization and dropping out of service.

5.3 Workshop with female officers and engineers in the DOI

The argument in this chapter is based on results from the questionnaire (see Chapter 4), and a workshop with female officers and engineers in the DOI. According to a senior female officer in the headquarters of the DOI, an agri-economist by profession, there were in 2011 in total 20 female officers and engineers in the DOI (see Table 5.1). This table presents fictitious names. Out of these 20 officers, 15 women participated in the workshop (noted with an 'x' in the far-right column of Table 5.1). For clarification, some of these women also acted as respondents for the questionnaire (see names and codes of the questionnaire in the second column). The organisation and purpose of the workshop requires some explanation.

During one of my visits to the central office of the DOI (Jawalakhel), my (male) research assistant who joined me, ran into a fellow graduate from his batch at the IOE, Dharan Campus. A few years earlier, they had completed a Bachelor in Agricultural Engineering, and she had become an officer in the DOI in 2009 (see Mrs. Thapa in Table 5.1). We ended up in a conversation and I asked her some questions on the position of women engineers in the DOI. Upon hearing about my topic, she proposed to organize a meeting with all female officers and engineers in the DOI. I made an invitation and she organized that it was sent around.

The idea of a meeting appealed to Mrs. Thapa, because the department had recently approved some new permanent positions for female engineers (gazetted third class), and she thought it was a nice idea for all the women and (new) girls to meet. She was also keen to discuss the position of 'lady engineers' in the DOI as I learned female engineers are known in the department, and to exchange experiences. She noted that it would be the first time that all female officers and engineers would meet – as women professionals in the DOI. In this regard, the workshop is best described as a piece of action research, shaping the organisation and (research) purpose of the meeting in the process of action (Reason and Bradbury, 2006). It required effort by Mrs. Thapa to get the meeting organized. One of her proposals was to make use of a room in the DOI building, to make it easy for all women to come and to have tea service available, and for this, she had to ask approval to her senior male boss, an engineer, the chief of the System Management and Training Programme of the DOI. I wrote a request 'to have an informal meeting (...) with women engineers who work in the Department of Irrigation' (research notes, 2-8-2011) and went with Mrs. Thapa to her supervisor. I introduced myself, she explained the request (in Nepalese) and our proposal was approved.

Table 5.1: Overview of female engineers and officers in the DOI

No	Name (fictitious) & codes*	Caste or ethnicity	Education	Position in the DOI			Est. age	Present in the meeting
				Category	Class	Appointed		
1	Mrs. Devkota	B/C	BE Civil	Div. Engineer	G2	2010 (p)	-	-
2	Mrs. Pradhan	Newar	BSc Chemistry	Div. Engineer	G2	2007 (p)	50	x
3	Mrs. Sakhya/ Q33FGII/ (C)	Newar	CL, BSc, MSc Agri-economist	-	G2	2000	50	x
4	Mrs. Bacharya	Newar	-	Engineer	-	-	-	x
5	Mrs. Shrestha/ Q34FGIII	Newar	CL Architecture Engineering	Engineer	G3	2007 (p)	50	x
6	Mrs. Sakiyama	Newar	CL Architecture Engineering	-	G3	2007 (p)	45	-
7	Mrs. Maharcha	Newar	CL Architecture Engineering	-	G3	2007 (p)	-	-
8	Mrs. Maharjan/ (I)	Newar	BE Civil	Engineer	G3	2007	30	x
9	Mrs. Malla/ Q39FGIII/ (G)	Newar	BE Civil, ME Water Resources, MSc Rural Development	Engineer	G3	2009	30	x
10	Mrs. Thapa/ Q38FGIII/ (D)	B/C	BE Agriculture, ME Water Resources, MA Sociology	Engineer	G3	2009	30	x
11	Mrs. Dongol/ (E)	Newar	BSc Hydro Geology	-	G3	2009	30	x
12	Mrs. Pandey/ Q22FGIII/ (B)	B/C	BE Civil	Engineer	G3	2010	30	x
13	Mrs. Ghimire/ Q31FGIII/ (F)	B/C	BE Civil	Engineer	G3	2010	30	x
14	Mrs. Karmacharya/ Q32FGIII	Newar	BE Civil	Engineer	G3	2010	30	x
15	Mrs. Limbu	Janajati	BE Civil	Engineer	G3	2010	30	x
16	Mrs. Bhandari	Newar	BE Civil	Engineer	G3	2011	28	-
17	Mrs. Upadhyay	B/C	BE Civil	Engineer	G3	2011	28	-
18	Mrs. Madhar/ Q30FGIII /(H)	Newar	BE Civil, ME Structural Eng.	Engineer	G3	2011	28	x
19	Mrs. Belbase/ Q28FGIII/ (A)	B/C	BE Civil	Engineer	G3	2011	28	x
20	Mrs. Upretri/ Q29FGIII	B/C	CL Civil, BE Agriculture	Engineer	G3	2011	28	x

Source: Information provided by a senior female officer (agri-economist) in the DOI, August 2011.

Abbreviations: B/C = Bahun/Chhetri; BE = Bachelor Engineering; BSc = Bachelor of Science; CL = Certificate level; G2 = Gazetted second class; G3 = Gazetted third class; MA = Master of Arts; ME = Master of Engineering; MSc = Master of Science; (p) = promoted.

*'Mrs' is used for all respondents but not all were married (yet); in total, 10 female officers acted as respondents for the questionnaire and the code is mentioned; in total, 8 participants in the workshop are quoted in the annexes of this book and a letter-code is mentioned (A, B, C etc.).

Mrs. Thapa also directed me to Mrs. Sakhya, the senior female agri-economist in the DOI. She is portrayed by her (male) colleagues as the 'gender focal point' of the DOI, causing a fair amount of frustration on her side. She explained to me about all the gender policies in the government of Nepal, advocating for women's rights – and that is the reason Mrs Thapa directed me to her – but mainstreaming gender in irrigation was not part of her (formal) work duties and she felt that the issue was not taken up seriously in the DOI.

In the meantime, I tried to find a female, Nepalese facilitator at short notice to help with the meeting. I was keen to limit my own role in the meeting, being a man, being from the West and given the subject of discussion, and I thought about not being present in the meeting. Then, I asked Riti to help out as a facilitator and I approached a female graduate of *NEC*, with whom I had worked before as a research assistant, to act as a translator in case this was necessary. Riti was acquainted with the topic of my PhD study, she had done her bachelor thesis in rural development on gender and had extensive experience with participatory workshops because she is a professional group facilitator. The workshop was held in English, in a conference room in the headquarters of the DOI on August 5, 2011 from11:00 to 13:00. I limited my own role in the meeting to a short introduction of myself and the topic of study. Mostly I listened to the talking and made observations, and I placed myself on a second row of chairs to keep myself in the background as much as it was possible. The meeting was recorded (mp3) and conversations have been written out (see the annexes).

I designed a programme for the meeting with Riti, based on my conversations with Mrs. Thapa and Mrs. Sakhya. I focussed my research question on understanding the working culture of the DOI and on documenting possible gender issues on the career path of women engineers, having the concept of 'roadways' in mind (see Chapter 3). The programme of the meeting is presented in Annex 29. The meeting was organized in three parts. The first part was an introduction-round for all participants. The second round was an exploration and discussion about personal challenges that participants encountered in their working environment and in their career. The third part was a plenary session which focussed on defining the working culture in the DOI. The participants were asked to make a drawing about their past and expected career path, like a timeline in a graph. These drawings were presented to the group and discussed. They were also asked to write down a definition of 'masculine working culture' and also these definitions were discussed.

Figure 5.1: Engineers and officers in the DOI

Source: My photo, taken in August 2011

Some of these exercises turned out to be more difficult than expected. As noted, 75% of female officers and engineers in the DOI participated in the workshop, but only a handful of women in the meeting had long-time working experience in the department. In total, 3 participants (civil and agricultural engineers) had joined the DOI very recently and another 7 participants (civil and agricultural engineers and one hydro-geologist) had joined the department in the last 2 years. For clarification, not all the participants in the meeting were engineers by education, hence, my use of the term of 'female officers' in the DOI. That having been said, also the officers who were not trained as a civil or agricultural engineer (5 in total) considered themselves an 'engineer' except for the agri-economist. In the DOI, the terminology of postings (gazetted first, second, third class) is tied up with engineering terms. The (senior) women who had been educated in architecture engineering considered themselves overseers (non-gazetted first class) and engineers (gazetted third class). Likewise, the senior female officer who was trained in chemistry considered herself a 'divisional engineer' (gazetted second class). Nevertheless, these women are unlikely to become a 'real' Irrigation Engineer, because this would require a degree in civil or agricultural engineering.

Also the caste and ethnicity of the participants reveals that female officers and engineers in the DOI have a diverse background, reflecting the general situation in the civil service: they mainly had a B/C and Newar background and there was one Janajati. Interestingly, Newar women are 'overrepresented' compared to other caste and ethnic categories while Madhesi women engineers do not seem to exist (see Table 5.1). This pattern confirms the observation that (high-class) urban-based families are more likely to send 'their' girls for engineering education (the Newar), and also that gender role patterns in the Madhesi culture are practices more conservatively than among the B/C castes in the Hills (see Chapter 3). Figure 5.1 presents a group picture of the participants in front of the building of the headquarters of the department – the 'first' meeting of women water professionals in the DOI.

5.4 Awareness of engineers about masculinities in the DOI

This part of the chapter documents the awareness of officers and engineers in the DOI about the dominant working culture and 'masculinity' in the organisation, based on answers of the 36 respondents of the questionnaire and the results of the workshop.

5.4.1 Perceptions on the normative culture and male domination in the DOI

Generally, when asked in open interviews or in conversations, male and female engineers readily answered with descriptions of the normative professional culture in the DOI. Also the respondents of the questionnaire had no trouble with this question. A compilation of the answers in the questionnaire is presented below, using some of the wording of respondents:

> ***The dominant professional culture in the DOI:*** The professional culture of the DOI has the following characteristics: (a) construction oriented; (b) participation of users is

> considered a formality; (c) negligence in operation and maintenance of irrigation systems; and (d) a low interest in the management of irrigation systems (Q2MGI). The most important offices of the DOI, the Irrigation Development Divisions at district level, are controlled by engineers and technicians, and function predominantly as technical offices (Q13MGIII). The ‘rooted culture’ of developing irrigation infrastructure by civil engineers is gradually changing, because development and management issues are now equally emphasized, and the focus has shifted to issues of equity and transparency in regard to the transfer of system management from government to users (Q1MGI). In addition, the professional culture of the DOI is also changing, because ‘lady irrigation engineers’ are now entering the DOI, as well as other professions, like geologists, hydrologists and sociologists (Q21MGIII).
>
> The professional culture of the DOI is also determined by the bureaucracy of the government (Q3MGII). The irrigation bureaucracy is strongly policy and programme oriented (Q19MGI; Q37MGIII), and juniors have to obey senior officers to prevent problems arising during promotions (Q4MGII). Generally, the employees' morale is low because their income (following government pay scales) is insufficient for meeting basic needs (Q12MGIII). In addition, the irrigation bureaucracy is characterized by widespread malpractices, and in many cases, professional ethics are not upheld (Q3MGII). The DOI is capable to execute irrigation projects by procedure, following genuine intentions, but projects often happen as a result of political influence that runs from top to bottom in the organization (Q3MGII).

The answers of the questionnaire also reveal that male and female engineers know about prevailing gender patterns in the organization. Both male and female engineers (n=35) are aware that the DOI is numerically dominated by men; they estimated 88% male against 12% female staff in the DOI (see Annex 30). They also are aware that female officers hardly occupy high management positions in the DOI. In total, 78% of the respondents (n=23) stated that they had worked with a female engineer, but only 30% noted to have worked with or under a senior female engineer, and this can be considered an optimistic estimate given the low number of women officers in the DOI. When asked to rank management levels in the irrigation sector on the scale of ‘male domination’, respondents (n=28) identified the higher irrigation management levels – national and district offices, and international conferences – as the most male dominated level (see Table 5.2). This ranking aptly illustrates, as perceived by officers and engineers of the DOI, that the culture of male domination has strong elite, international and professional dimensions – an instance that practices of masculinity have strong connections with engineering and water professionalism in the West.

Table 5.2: Perceived male domination at management levels in the irrigation sector

Level	Description	Score (n = 28)	Ranking
Higher Irrigation Management	National level (DOI, NGOs, research)	2,8	1
	District level (DOI, NGOs, DDC's)	3,0	2
	International level (conferences)	4,0	3
Lower Irrigation Management	AMIS system level*	4,2	4
	WUA level	4,6	5
	FMIS system level	4,9	6
Farm Irrigation	Field level	5,3	7
	Farm household level	6,1	8

Source: Questionnaire, 2011. **Note:** Respondents ranked the levels from 1 (most male dominated) to 8 (least male dominated). Not all respondents ranked neatly, but all values were added and divided by n. * AMIS = Agency Managed Irrigation System.

Nor did respondents have trouble to give descriptions of stereotypical profiles for male and female officers in the department. A compilation of the answers is presented below:

> ***The stereotype female profile in the DOI:*** Female employees in the DOI – perceived from upper-caste, Parbatiya – are mainly associated with low profile secretarial work (Q6MGIII, Q21MGI), even though there are (now) female engineers and planners at various levels in the agency, sharing the same responsibilities as male engineers (Q22FGIII, Q24MGIII, Q35MGIII). They mainly function as section officers, secretaries and computer assistants (Q9MNGI), and are perceived to attend to office work, following the instructions of men [the boss] (Q4MGII). Female officers are allocated the maximum amount of jobs that fall under desk work (Q4MGII), and they are expected to be sincere, responsive and polite in every activity (Q1MGI, Q9MNGI).

> ***The stereotype male profile in the DOI:*** Male employees in the DOI – perceived upper-caste, Parbatiya, Madhesi, and above 45 years old – are mainly associated with engineering work and high management positions (Q8MGIII, Q30FGIII), even though there also are young engineers in lower management positions, and men also work as office managers and institutional development specialists (Q3MGII, Q6MGII, Q14MGII). The work of men is associated with technical work, such as surveys, field visits, and making estimations for design (Q9MNGI). Male officers function as engineers in project supervision and construction management (Q1MGI), as planners,

as senior post holders, and as secretaries of the Department of Irrigation and in the Ministry of Irrigation (Q30FGIII).

Male and female respondents (n=34) were aware that gender patterns influence social behaviour and they admitted that they (often) behave differently towards a female colleague compared to a male colleague (see Table 5.3). Respondents were asked to mark a maximum of four descriptions about their behaviour towards female staff in the DOI. Some engineers marked one description only, while others decided to mark more than four. For the analysis, all marks have been counted. Table 5.3 reveals, on the one hand, that 44% of the male (n=27) and 71% of the female respondents (n=7) qualified their behaviour towards women as similar as that to men, but on the other, that many respondents, both male and female engineers, said to adopt a different attitude. For instance, 81% of the male engineers reckoned themselves to behave more politely towards women colleagues, 63% considered themselves to be more respectful, and 41% reckoned themselves to behave in a more friendly manner. Also female engineers (57%) noted themselves to act more friendly towards female colleagues, and both male (59%) and female engineers (43%) considered themselves to treat female colleagues with more patience. Only 11% of the male respondents qualified their behaviour to female colleagues as competitive and 22% of the male engineers admitted to have lower expectations of their female counterparts, a phenomenon that also has been reported in literature (Adhikary, 1995: 31; WECS/BSESC, 1996: viii).

Table 5.3: Behaviour towards women colleagues in the DOI

Answer (n = 34)	**Male officers**		**Female officers**	
	(n=27)	**%**	**(n=7)**	**%**
More friendly than to male colleagues	11	41%	4	57%
More polite than to male colleagues	22	82%	2	29%
Competitive	3	11%	2	29%
Protective	4	15%	2	29%
Behaving like a father figure	6	22%	-	-
More open than to male colleagues	2	7%	2	29%
More patiently than to male colleagues	16	59%	3	43%
More respectful than to male colleagues	17	63%	1	14%
Similar as to male colleagues	12	44%	5	71%
Having lower expectations than to male colleagues	6	22%	-	-

Source: Questionnaire, 2011.

5.4.2 Is the DOI considered masculine by engineers?

Seemingly paradoxically, officers and engineers are aware of the normative culture and gender patterns in the organization, but they do not qualify the dominant culture in the DOI as 'masculine', nor do they see 'male domination' as a typical and problematic characteristic of the irrigation profession. This is illustrated by answers of respondents (n=36) on statements about the professional culture in irrigation (agree, disagree, neither agree nor disagree) (see Annex 30). The normative culture in the DOI is mainly qualified by engineers as a civil engineering culture, and it is this culture – not the masculinities associated with male and upper-caste domination per se – that is perceived as problematic. In total, 59% male and 67% female agreed that 'there are too many civil engineers in irrigation', and 74% male and 78% female engineers agreed that 'there is a need for more social workers in irrigation'. However, these answers should not be taken at face value. Qualifying the dominant culture in the DOI as 'masculine' and seeing it as a problematic characteristic of the irrigation profession, would instantly provoke questions about the gender performance of engineers and the associated practices of exclusion (cf. Gupta, 2007). This crisis tendency is dealt with by displaying the performance of the DOI as an issue of professional discipline, unrelated to gender and caste. Thus, when male engineers were asked, only 33% were prepared to agree that 'male domination in irrigation is a problem'. In contrast, looking to 'the excluded', no less than 67% of the female engineers agreed with this statement. Another illustration of this crisis tendency is that only 33% male and 11% female engineers (both from upper-castes) were prepared to agree that the 'irrigation sector is high-caste dominated'. The latter statement provokes hard questions about the performance of male *and* female engineers in relation to caste discrimination and would thus be best avoided by members in the COP of the National Elite.

In a similar fashion, questions on women professionals in irrigation were dealt with by respondents without reference to the prevailing culture of male-domination in the department, particularly by male engineers, and without much realization what this culture means for female staff. Thus, male (44%) and female engineers (56%) generally felt that 'women change the professional irrigation culture'; both male (78%) and female engineers (100%) agreed that 'more women water professionals is a good thing'; and male (74%) and female engineers (100%) were confident that 'women can be very good irrigation engineers'. Also, 89% male and 100% female engineers were in favour of formal gender equity, and both male (59%) and female engineers (67%) agreed that 'the irrigation sector is becoming more women friendly'. The responses on these statements reveal a perception that gender issues like 'masculinities' do not matter for engineering. They expose an expectation-cum-assumption that there are no barriers for women engineers in the DOI to perform their job. This perception is particularly strong among male engineers. Male officers (41%) generally agreed with the statement that 'there is no discrimination against women in the irrigation sector', while female officers (67%) clearly disagreed, sharing the opinion that there was. Discrimination against women was not seen as typical for the DOI, and not as something that required specific attention. Both male (85%) and female engineers (78%) felt that 'equity in irrigation governance will come with time'. In other words, it will come with time as part of supposedly broader processes of emancipation in the Nepalese society.

In this context, definitions of masculinity of women officers and engineers in the DOI are situated. In the workshop, participants were requested to write down a definition of masculinity in their own words. The goal was to find out whether women officers and engineers related their experiences to a specific masculine culture in the organisation. This turned out more difficult than expected. Participants associated some of the challenges in their career with gender (see further on), but were unfamiliar with the concept of 'masculinity'. To make the exercise work, the concept of 'masculinity in the DOI' was established as behaviour and practices related to men and manhood. This gave the participants a starting point to write down definitions on cards, first individually, than in pairs, and finally in two groups. The definitions are presented in Table 5.4, taken literally from the cards.

An analysis of the definitions produces the following insights; first, it shows that women officers and engineers in the DOI associate masculinities with a *general culture* of 'domination', 'superiority', 'male decision making', and 'the traditional way'; and connect behaviour of men to practices like being 'non-cooperative', 'over ruling', 'not giving opportunities', 'pulling legs', 'jealousy', 'corruption' and 'boasting about their greatness'. Second, it reveals that women officers and engineers basically associate *all affairs* in the DOI with masculinities – the hierarchical organization, the controlling (and over ruling) of subordinates, the opportunistic behaviour of engineers, and the misuse of resources. This should not come as a surprise, because there are hardly any other people than men in the DOI. Third, it shows that women officers and engineers do not perceive the culture of masculinity as *tied specifically* to the DOI. The following definition is telling in this regard: 'Masculinity in DOI is [the] same [as in] our society'. Illustrative is also a complete lack of words like 'bureaucracy', 'engineering', 'structures', 'design', 'construction' and 'hardware' in the card-definitions of the workshop participants. As noted in Chapter 1 and 3, these terms can be considered symbolic markers of a culture of masculinity in irrigation professionalism, but thus not by women officers and engineers in the DOI *themselves*. This suggests that women engineers, like their male counterparts, have internalized a conviction that the practice of science and engineering is rational and universal, and is totally disconnected from gender-related problems (cf. Gupta, 2007). Masculinity in the DOI, as far as male and female engineers themselves are concerned, is considered something of the family-society sphere and of traditional norms, a culture that permeates the professional sphere in the DOI and is not perceived as related to engineering or irrigation itself. Unsurprisingly, prevailing gender norms in society – not their 'own' masculine practices – were identified by respondents of the questionnaire as the biggest obstacles to achieve gender equity in irrigation (see Annex 30).

Table 5.4: Card-definitions of masculine working cultures in the DOI

Individual definitions
1. Masculine working culture in DOI: Dominating, superimposing, over ruling [and] unfair to the women and ultimately to society as well. 2. Masculinity in DOI: Superior feeling of a male over an equally or more capable and confident woman (...). 3. Masculinity in DOI means 100% engineers. [Every]one in DOI is male before 5 years ago. Even 3 years ago there is only 1,5% of total manpower are in DOI is female (...). Within the [last] few years about 14 engineers [have] entered here. 4. Masculinity in DOI: Running after (...) success even by pulling legs of other (...). 5. Masculine culture in DOI: Males make decision in every level, about going to field, about working in office, about giving opportunities regarding training, participating seminars, going abroad, irrespective of our interests [and] wishes. 6. (1) Bias[es] in giving equal opportunities in office work; (1) given opportunities only when our male friends fail to do the job or they say 'no' to the job; (2) even when we (...) do something our seniors boast about their greatness in giving us opportunit[ies]. 7. In a male dominated department, masculine culture can be defined as being superior in every decision making (...), along with bias[es] in giving equal opportunity [to] equally or more capable women or giving 'left over' jobs.
Definitions per duo/trio
1. Bias[es] in giving equal opportunities and opportunities are given when only male friends fail to do job or they say 'no'; and after giving 'left over' jobs, seniors [boast] it as their greatness in giving us opportunit[ies]. 2. Masculinity in DOI: Superiority (...) towards equally or more capable women. 3. Masculine working culture in DOI – bias[ed], over ruling, dominating, superimposing, [and] ultimately UNFAIR to women and non-cooperative.
Group definitions
1. Masculinity in DOI: Dominating nature, opportunist, misuse of resources. 2. Masculine culture in DOI: Biasing, over ruling, dominating, super imposing, [and] unfair to women.

Source: Workshop, 2011.

In this background, it suggests that officers and engineers in the DOI do not share a deeper awareness that the cultivation of professional desire is a process that re-enacts associations in the working culture of the organisation with masculinities. Among the statements on gender and the professional culture in the questionnaire, respondents (78% both for male and female engineers) agreed that 'irrigation engineers' priority is water use efficiency', and both male (85%) and female engineers (89%) noted that the 'expansion of irrigated area is an important concern'. Professional desire was clearly not perceived by engineers themselves as an expression of masculinity, nor associated by questionnaire respondents with a 'masculine' claim of what is real and important. Respondents thus did not show an awareness that users' participation and gender are treated as low professional priorities (see Chapter 5), partially *because* these polices are framed *in the context* of a 'masculine' and normative working culture of the DOI. Engineers know that administration in the irrigation sector is dominated numerically by men, particularly at higher management levels (see above), and they know about diversely gendered situations in the field – the involvement of men and women in irrigated agriculture, the existence of female-headed households (see Annex 31) – but they do not see how the framing of users' participation and gender policies as an argument of economy and technical efficiency, is linked to professional aspirations that characterize the 'masculinity' of the normative working culture in the DOI. Questionnaire respondents supported users' participation, because '[the] burden and responsibility of [the] government will be shared' (Q11MNGI), and 'the more user participation, the more efficiently an irrigation system works' (Q12MGIII). Also engineers approved gender policies, because 'without one of them [man or woman], [the] project will not be successful' (Q4MGII), and '[gender policy] provides [for] sustainable irrigation projects' (Q13MGIII).

5.5 Negotiating self-normalization in the family and professional spheres

Self-normalization has been defined as a process of developing agency through social learning, a process in which apprentices, through everyday interactions with their masters, develop self-justifications (and counter-justifications), reconfirming knowledge claims about professional performance and reifying the bodily performance in relation to knowledge claims about masculine and feminine behaviour (see Chapter 1 and 4). As noted, self-normalization *simultaneously* takes place in the family-society sphere of the COP of the National Elite and in the professional sphere of the COP of the Irrigation Organisation. This implies that junior female engineers can be expected to face particularly strong challenges in the DOI, because it is the prevailing social stereotypes and cultural norms in the COP of the National Elite that designate the family sphere as suitable for women and the professional sphere as suitable for men, as exemplified by the performance of Elite Manhood. This section, complementary to Chapter 4, highlights the (specific) norms that women need to negotiate and learn about for becoming an Irrigation Engineer. The analysis mainly relies on results of the workshop.

In pursuit of a career as an engineer, women professionals in Nepal, first and foremost, face additional challenges *within the family sphere*, as a result of gender stereotypes and cultural norms that govern the COP of the National Elite. Women engineers in the DOI explained to me that they – as girls – received encouragement from their family to pursue engineering education, but that they – as married women – have faced disapproval to pursue a career that requires field work, particularly from in-laws. This dynamic is known in Nepal. Adhikary (1995) reported that just 32% of female graduate students in technical disciplines (n=69) received support from family members to follow-up on a career, although 84% of the women, once in service, were supported in discharging their duties (presumably mainly for office related work). It is practice among high-class, upper-caste families that women follow an arranged marriage and then live with the family of their new husband. According to Hindu customs, she is then expected to perform tasks for her new family, such as making food, washing her parents-in-law, giving birth to children and overseeing the household (cf. Bennett, 2005 [1983]). In this context, women professionals, unlike their male counterparts, are faced with time constraints, being held responsible for home jobs as well as for professional tasks, particularly when there are no domestic servants. WECS/BCESC (1996) reported that 94% of women professionals in the water sector in Nepal spent about 5,6 hours per day on household tasks next to their job obligations. Cultural obligations for women vary widely depending on how strong traditions are followed, but generally, social expectations become even more difficult to negotiate for women, when the husband secures a job or posting outside the Kathmandu Valley, a situation that is not uncommon in Nepal in the COP of the National Elite. The 'wife' is then (doubly) expected to stay at home. She has to look after the children and if she cannot because of 'her' career, it is perceived that she 'burdens' her female in-laws, because they are then held responsible. In contrast, the husband has ample opportunities to pursue a career because he is not expected to stay at home for child care.

Time constraints like an additional 5 to 6 hours per day in the household next to professional duties were, however, a minor concern for women officers and engineers in the DOI, compared to the taboo that exists for upper-caste women to travel to the field. Male members of the household are considered responsible for 'their' women and are reluctant to have 'their' women travel to the field, stay overnight or take residence in rural areas. This situation is particularly true for married women and the workshop participants shared many grievances on this point. They are simply not expected to develop or express aspirations for field work, and there is often no opportunity at home to discuss this issue openly with their in-laws. Their concerns are simply ignored, a situation which was called the 'silent threat' (not being listened to) and it was seen as a form of 'mental violence' by the women (see Annex 32).

In the family-society sphere of the COP of the National Elite, the cultural norm is that men pursue employment in the civil service as an engineer. The following two quotes reveal that it takes specific courage for women to pursue a career as an engineer: 'I basically joined engineering, because somebody told me, being a woman, engineering is not for you' (Workshop Tape 1, 14:45), and 'I am working as a civil engineer since the last four years, and basically I joined engineering (...) not just because (...) I want it [but] also because our country needs female engineer[s]' (Workshop Tape 1, 16:08). In this background, the development and expression of a typical engineering desire, through acts of self-normalization, is a critical strategy for women engineers to perform up to the (male) standard, technically and culturally. Thus, women officers and engineers, like their male counterparts (see Chapter 4), clearly articulated their motivation for engineering by expressing the desire to contribute to the development of Nepal, to secure an income or because of preferences and positive associations with the profession, and they see it as a process of personal fulfilment. Similar to men, they explained that engineering is about 'technical work', about 'drawings', 'design' and 'calculation of structures', about 'practical' and 'construction work'; and they described that an engineer is 'proud', 'tough' and finds 'inspiration in the field' by 'hard work' and by facing 'challenges' to see 'work coming to shape'. As noted in Chapter 4, these characteristics are recognized in the DOI as the attributes of masculinity (see the intersections between the stereotypical profiles of the Irrigation Engineer in Nepal and an elite or educated, high-caste man in Nepal in Chapter 4), and by stating these aspirations, women officers and engineers basically self-discipline themselves as engineers, but they also come to face the challenge to overcome questions about their femininity and being a 'good' woman.

There are, of course, limits to self-normalization. As discussed, not everybody is entitled to become an Irrigation Engineer and offering engineering advice is contested. Male engineers in the informal milieu of the DOI, *as a group*, appear not to entitle women to the performance of a 'real' Irrigation Engineer. Illustratively, typical descriptions of 'engineering' and the 'engineer' in the questionnaires, filled-in by men, start with 'he'. Also SaciWaters (2011) reports this phenomenon. Furthermore, women professionals *themselves* may not be ready to sacrifice their femininity in acts of performing like a 'real' Irrigation Engineer. These two 'forces' provide for the social construction of 'lady engineers' in the DOI. This stereotypical performance is highly problematic for women engineers, because it puts them in a position in which they constantly need to prove and explain that they are capable professionals. The stereotypical characteristics of the 'engineer' and 'lady engineer' are presented in Table 5.5, based on responses of the women officers and engineers in the workshop.

Table 5.5: Associated characteristics of engineers and lady engineers in the DOI

"Engineer"	"Lady engineer"
he	she
men	women
norm (large in number)	exception (few in number)
senior, intermediate, junior levels	junior levels
real engineering work	secondary and complementary work
field work	office work (e.g. training, design)
reliable (for field work)	liability and burden (for field work)
capable and competitive	need special treatment
strong (physical stamina)	weak
first choice	second or 'left-over' choice
shirt, pants, shoes or official dress for men	saris, sandals or official dress for women
use of cars and bikes	walking, public transport, brought to work
comradeship (drink, smoke, dance, etc.)	threat and risk

Source: Workshop, 2011.

The stereotypes in Table 5.5 clearly reveal that male engineers in the DOI are the cultural norm in the informal milieu of the organization – as engineers; an identity that is defined by 'the other', by female engineers – as lady engineers. This dynamic is known in literature as alterity: identity formation through a process of 'othering', marking groups as different and excluded (Whitehead and Barrett, 2001). The stereotype of the lady engineer aptly demonstrates the limits (or risks) of self-normalisation for women professionals in the DOI. Performing up to the norm potentially comes at the cost of femininity, while being branded as a 'lady engineer' results in being treated as a left-over option, unsuitable for field work and fit only for secondary tasks at the office. In contrast, for junior male engineers, the stereotype of the engineer provides for an overt opportunity to become a 'real' Irrigation Engineer through acts of self-normalization, notably through the participation in field work. Female engineers are faced with spending most of their energy in not being normalized and disciplined *only* as lady engineers. In this regard, my invitation for the meeting had met with approval, because it had addressed them with 'dear engineer' rather than 'dear lady engineer'.

The profiles of the engineer and lady engineer can be considered vignettes of behavioural practice in the informal milieu of the DOI, and women officers and engineers told many stories how these stereotypes were 'played out'. An elderly participant in the workshop explained that the guards at the entrance gates of the DOI premises only salute men and do not salute her. She explained that only those who ride motor bikes and are driven around in cars are saluted by the guards, and these people are basically only (senior) male officers (see

Annex 33). Generally, and this is most problematic for women engineers in the DOI, the stereotype of the lady engineer provides male engineers with a justification to legitimize their behaviour towards female colleagues, and deny them opportunities to participate in field work and take up postings in rural areas. At the same, women engineers also use the stereotype to explain decisions for not taking up (unattractive) assignments in remote areas. This issue is further discussed below, particularly in relation to field work.

5.6 Chances for transitional performances in the college and in the field

This section conceptualizes and thinks through the position of women engineers in regard to transitional performances. Transitional performance has been defined as a process in which liminars develop agency through undergoing a change during an intense experience in their lives, disconnected from daily practice. Two experiences have been described by male DOI engineers as particularly intense, the college years and field work as part of the first years of employment. These periods have been conceptualized as rites of passage and the terms communitas, catharsis and cathexis have been used to capture the qualities of transition that liminars (need to) undergo for becoming an Irrigation Engineer (see Chapter 4). This section assesses the 'access' that women have to the college and the field, whether those periods are experienced by women with similar intensity as described by men, and hence, to what extent these periods (can) function for women as rites of passage for becoming a 'real' engineer.

Historically, women have had very limited access to the formal engineering institutions of education and employment (see Chapter 3 and 4). In spite of a growth in entry of girl students at engineering colleges in South Asia, the majority of the engineering graduates still consist of (upper-caste) boys (Parikh *et al*., 2003; Parikh and Sukhatme, 2004; Nair, 2012). In this respect, the college has always been a very different place for girls compared to boys. Until recently, engineering colleges in Nepal, notably the IOE, did not have hostel facilities for girls (see Chapter 3), and when they had, as at Roorkee in India, it was a hostel kept aside from the sleeping quarters of boys and under strict surveillance of the authorities. The behaviour of girls at colleges is monitored, for instance, through an evening curfew for girl hostels. Such a formal measure prevents girls from working in boys hostels and staying up late for studies, a practice that is not uncommon among boy students.[30] Girls also are under constant scrutiny in the informal milieu of the colleges. The low number of girls in engineering education essentially make women 'tokens' in the institution and this leads to 'heightened visibility' (Kanter, 1977 cited in Gupta, 2007: 519). Their blunders and successes are in the spotlight, everyone is curious how girls will perform, their absence from class is easily noticed and girl

[30] I experienced this myself when I worked together with six students from IAAS in Chitwan District, among them were three girl students. We returned relatively late in the evening from interviews and the girls had to skip dinner to make sure that they were back in the hostel in time, while I could spend time with the boy students to discuss work and have food. Also Gupta (2007) reports these measures for IIT's in India.

students are known by name and face. Heightened visibility makes girls reluctant to raise questions in the class room (Nair, 2012), and translates into the exclusion from informal interaction, a process that is known as ‘boundary maintenance’ (Gupta, 2007: 519). In other words, boys have their own circles, and girls have to keep distance for the sake of decorum.

An account of Mr. Basu, a student at Roorkee in the 1980s, is illustrative for the position of girl students at engineering colleges. He recalled that there were two girl students in his batch at Roorkee, who stayed in a separate girls hostel. He explained that ‘they were intensively kept in the same [sex] group, so that they can talk [to each other]’. He continued, ‘it was really difficult [for them]’, saying that ‘these two girls [in his batch] had some sort of problem’, because they were always seen together, hardly interacting with other students. Mr. Basu also recalled that girl students had their own facilities during field excursions, staying separately from the boys in the camp site of the professors, emphasizing that the girls were well taken care off (MB Tape 2, 1:10:00 to 1:10:15). This story reveals how girl students are under constant scrutiny, formally and informally, how they perform as tokens in the organization, and how they have to handle their visibility (and exclusion) in informal interactions among students and teachers. Getting a degree at Roorkee in the 1980s, was for most girls like walking on thin ice.

In regard to field work, employment in engineering has remained a closed bastion for women professionals in Nepal. There are some women engineers in Nepal – about 15 engineers in the DOI in 2011 – but they face difficulties in making a career, and often choose to leave service after a period of 5 to 6 years (see above). The biggest issue is that women engineers are reluctant to partake in, *and* are also denied opportunities for, assignments that require field work. Participation in field work is critical for an engineering career, particularly for junior engineers. The following figures for DOI staff can be used as a reference: 20% of the staff regularly spend 6 to 10 nights away; 24% spend 11-20 nights away; and 8% spend more than 21 nights away (DHV/APROSC/WB, 1989).[31] Without the aspiration and opportunity to stay *overnight* in the field, it is impossible to become an Irrigation Engineer.

Generally, the dynamics as identified for the college also are at play in the DOI. First, the behaviour of female officers is under close surveillance of higher management. The formal chain of command, and the rules and regulations for promotions and postings are used to ‘keep’ women at the central offices, and assign to them paper work and tasks that are considered of secondary importance. This is done because many senior male officers are reluctant to have women engineers in ‘their’ (field) office. Second, as a result of their low number, women engineers suffer heightened visibility in the informal milieu of the DOI, are

[31] ERA (1973: 24) reports that overseers spend about 3-4 months a year on technical work and the remaining 8 months on administrative work, due to monsoon (3-4 months) and slow budget release (3-4 months).

faced by acts of boundary maintenance among male colleagues, and have to maintain distance from informal gatherings among men to keep decorum. Women in the workshop explained that they always have to be vigilant about other persons in the office when they speak with their supervisors, because more men in the room can easily lead to jokes and insults that are embarrassing for them (e.g. how they look today, what they wear, who they like). For the same reason, one female engineer explained that women officers walk away and cannot hang around after meetings with colleagues once formal matters have been discussed, because ‘the chat’ will move into a different orientation. Here, women engineers also talked about cases of sexual harassment, physically as well as non-physically, through talk, jokes and insults (see Annex 34 for an excerpt of the discussion). This situation also exists in foreign-supported irrigation projects in Nepal and is not much different for engineers and project staff from abroad, presently and in the past. Mr. Boom, engineer in the Mechi project, described SNV in the 1980s, for instance, as an engineers’ and men’s club.

In sum, it appears that experiences of girls at engineering colleges, and of women engineers and staff of the DOI and SNV in the field, were (and are) markedly less transitional than those of men. In the perspective of communitas, girl students have to restrict themselves in friendships with fellow (male) students, while boys have plenty of time to hang out together (e.g. visit the cinema), marking the college years for girls as an individual experience rather than as a shared experience of brotherhood. Mrs. Mangeeta Samratha, one of the few Nepalese girls who went to Roorkee in the 1980s, recalled that there were just a few girls in civil engineering and that she stayed separately in a girls hostel. She emphasized, more than the male respondents, the competitive attitude of students at Roorkee, and explained that she was always ready to compete and made sure that she obtained good marks. This can be understood as a case of heightened visibility – trying to be the best of the class. Her stories reveal that friendships between boy and girl students were essentially treated as a taboo or potential risk. Mrs. Samratha recalled how she was kept aside from the boys in a tent in the teachers’ camp and that she used to pick a different seat every time she had class, usually in front of the room. This was to avoid talk among students and staff that she always worked with the same (boy) student. These stories illustrate that friendship for girl students with (male) peers could only develop through (individual) competition – performing as the best of the class – rather than through an amicable and close sharing of experiences.

That having been said, also Mrs. Samratha (student at Roorkee) and Mrs. Vroeg (socio-economist in the Mechi project) told stories that reveal the intensity of their experiences during college and field years. Mrs. Samratha cherished warm feelings for Roorkee and characterized it as a safe environment where she never felt alone. She also showed to me an MS Office Excel sheet of Roorkee alumni which whom she was still in touch. Mrs. Vroeg felt connected with fellow Dutch SNV staff, even though most were engineers. As noted, she explained that the boundaries between personal and professional matters were blurred in the Mechi project and that she had a ‘great time’ in Nepal. Both Mrs. Samratha and Mrs. Vroeg felt connected to the Roorkee and SNV community respectively – the quality of communitas.

Theoretically, when conceptualizing the college and the field as rites of passage in the lives of (male) engineers, the presence of ‘women’, as the Other, constitutes a potential threat for the engineering culture and the prevailing gender order in society at large. As Turner writes, communitas is spontaneous and uncontrolled, a spring of pure possibility (Turner and Turner, 1978: 251) and the liminal phase in rites of passage embodies the threshold between old and new, and is anti-structural, creative and playful (Turner, 1987). He noted that liminal phases and communitas are regarded by the guardians of structure as dangerous, and are often hedged around with taboos, and associated with ideas of purity and pollution. Rites of passage constitute relatively indiscriminate practices that function to *include* every single participant. At some engineering colleges, *all* ‘freshmen’, regardless of individual qualities or cultural background, are subject to ragging rituals, making everyone ‘equal’ and a member of a coherent batch of students. The only requirement for this transition is to get through it and make it to the end. In this perspective, the participation of women in engineering studies and field work constitutes a potential threat to the power of men and the performance of Elite Manhood, because ‘women’ may become equal with ‘men’ through partaking into spontaneous and uncontrolled actions of communitas. In this view, the college and the field are key sites for the production of masculinities in engineering, critically *defined* by the absence of women; places from which women need to be denied access at all cost. Here may lie a partial explanation for the persistent cultivation of a taboo for educated, upper-caste women to go to the field – the ‘last’ bastion of masculinity in engineering – because the colleges have now become a space in engineering also for women (see Chapter 3).

Also from a catharsis perspective, ‘women’ can be seen as a potential threat for men in the context of the college and the field because they may see or share situations of strong emotions, fear or break down among men, which subsequently renders impossible the renewal of a person as a ‘man’ in the prevailing gender order. Ideals of masculinity imply that ‘real’ men do not show weakness in front of women, meaning that the absence of women is required for boys to become men. This is also true for cathexis, particularly when considering the fixing or re-aligning of heterosexual desires during rites of passage. The framing of ‘women’ as objects of desire among young engineers, marking a culture of compulsory heterosexuality, can only occur in the absence of women. The presence of women engineers in colleges and in the field clearly goes beyond the performance of ‘mute’ female bodies. Mr. Upreti, who went to Baroda University for engineering studies in the 1950s, joyfully recalled, how he talked with his friends about the girl students at the geography department. The perception was that the ‘ladies [were] not very good [students]’, but that ‘they [girl students] were very active [and] notorious'. He told that the boy students went there to shout to the girls: 'your nose [is] like that, [your] legs [are] like that, and this and that' (SBU Tape 2, 1:03:00 to 1:04:30). This quote illustrates how women at engineering colleges 'perform' as objects of desire, a practice which requires that women are kept at a distance. Indeed, Mr. Uptreti recalled that there were no girl students and women teachers in the civil engineering department at that time. Then, there also are acts of homosociability among engineers (the 'wandering hand'), which are obviously taboo for male engineers in the presence of female engineers. Then it will no longer be playful and unremarkable, and it will produce shame and dishonour for the family of both male and female engineers, though more for those of women. In a culture of compulsory heterosexuality, men need to display a desire to penetrate for demonstrating qualities like autonomy, mastery, valour and virility – the attributes of masculinity, while women need to display a desire to act submissive – the attribute of femininity (Tamang, 2003). The cultivation of the aforementioned male qualities is difficult in the presence of women, because both male and female engineers need to maintain decorum.

The interviews with Mrs. Samratha, Mrs. Vroeg and the workshop participants were too short (or insufficiently in-depth) to assess aspects of catharsis and cathexis in experiences of female officers and engineers, particularly because many of them had not been to the field (yet). However, my impression is that qualities of catharsis are experienced less by women in relation to these particular phases. In the context of male environments in the college and in the field, men talked about experiences of personal transitions of the self, changing from a 'weak' boy into a 'tough' man, as if they had been purified from 'unproductive' thoughts by teachers and scientific knowledge, and had obtained a new clarity in their life. No such wording was used by female respondents, perhaps because being a 'tough' woman is not something to be proud of. In regard to cathexis, it is clear that women students and engineers, like their male counterparts, also undergo a process of developing agency in their education through the fixing of passion upon objects ('structures') and persons ('hero engineers'), even though many of them may not get opportunities to be actually seen with 'their' structures in the field. It also can be conceptualized that female officers and engineers in the college undergo an intense re-aligning of (compulsory) heterosexual desires, learning or 'being taught' to display a desire to be 'normal' and act submissive among a majority of men.

5.7 The biggest taboo for women engineers: Working "in the field"

The taboo in engineering for women professionals to work in the field is a serious problem for them. Technically, field work is essential for getting exposure, providing junior engineers a basic professional foundation. Culturally, field work is a key legitimate peripheral activity for junior engineers to learn about the performance of an Irrigation Engineer through acts of self-normalization; and for transitional performance, field work is perhaps the most important rite of passage for junior engineers to become a 'real' engineer. Technically and culturally, the

Irrigation Engineer is defined by 'his' capacity to undertake field work and the supposed 'inability' of women engineers to work at the site is the most persistent narrative to legitimize the 'absence' of women professionals in irrigation. This section unravels this taboo in order to understand how it is cultivated and also, to analyse the coping strategies of women engineers and to assess the meaning of role models in Nepal for female DOI engineers, such as perhaps (Western) female expatriates who are on mission in Nepal.

First, it is important to note that we are dealing with a *cultural taboo* and that the supposed 'inability' of women to travel into rural areas has nothing to do with biology or the anatomical specificities of women. The biology argument is often used though for claiming that women are unfit for travelling. For instance, WECS/CIDA (1991) noted that 'there is a popular belief (...) that an engineer's job is not for a lady for she cannot afford [to] do it (...) physically [because] it is too strenuous' (p.24). Also women engineers explained in the meeting that male engineers often use the argument that women are biologically weaker than men and lack the 'physical stamina' to participate in field trips (Tape 1, 53:10 to 53:50). In a similar fashion, I have spoken with male engineers who argued that women need more elaborate toilet facilities than men because of the biology of menstruation. This view ignores the reality of Nepal that about 40% of the population consists of rural women, who take upon their shoulders heavy workloads in agriculture (e.g. collecting water, fodder, fire wood) and prepare food, menstruate, bear children, walk long distances and make use of primitive toilet facilities 'in the field'. The biology argument also ignores the fact that some women professionals have always worked in rural areas in Nepal, as home scientists, JTAs and community development experts. The taboo is not a biology issue but *a gender issue*, more specifically *an issue of high-class, upper-caste and education status of women professionals*.

Second, it has been shown in Chapter 3 and 4, that women in engineering fall exactly in this category, they come from high-class, upper-caste and mostly urban backgrounds. This has always been the case in Nepal (Adhikary, 1995). In comparison to the figures in Chapter 3 and 4, a survey for the water and energy sector in the mid-1990s revealed that the 'majority of women employees are from urban areas (79%), aged below 40 years (83%), married (75%) and living in joint families (57%) [and that] about 80% of married women employees reported that their husbands also are employed in various organisations' (WECS/BCESC, 1996: 28).

Third, the cultivation of the taboo on field work requires considerable agency of women engineers *themselves*. To recall, all forms of desire are socially constructed and agency can entail any type of action (Mahmood, 2001; Bracke, 2008). Educated women in Nepal tend not develop a desire to work in the field, co-constructing the taboo. It is in this context that Adhikary (1995) argued that the absence of women professionals in natural resources management is not just a question of 'anti-female bias' by employers and male colleagues, but that 'women *themselves* and their families tend to distrust this type of employment, regarding it as unsuitable, and risky to (...) *her social reputation'* (emphasis added) (p.36-37). In similar words, WECS/BCESC (1996) reports for the water sector in Nepal 'that women, in general (...) do not prefer field-based positions or are compelled by their families not to accept such positions' (p.21), stating also that the '[m]ajority of the senior officials expressed the view that women employees in general are reluctant to go to the field, particularly in remote areas' (p.21). In this context, claims for a lack of 'trained female capacity' (WECS/BCESC, 1996: 16) and 'qualified female engineers' (Adhikary, 1995: 16) are situated. As noted, even then and certainly now, there were (already) sufficient female engineering graduates in Nepal, but '[f]inding women staff willing to live and work in remote projects has not been easy' (Chhetri and Lingen, 1998: 64), as it was reported for SNV programmes in Nepal. Women professionals' 'unwillingness' to work in the field (Adhikary, 1995: 15) and acts of prioritizing household responsibilities over professional duties (SaciWaters, 2011), reinforces the taboo, producing a feeling among male officials that women cannot perform well in the field and resulting in employers giving preference to men in recruitment.

Fourth, the taboo is primarily cultivated in the family sphere of the COP of the National Elite. Women officers and engineers in the DOI explained that their families, particularly their in-laws, disapprove that they pursue a professional career which requires field work, and here 'security concerns' and 'safety issues' enter the discussion. Security and safety concerns of women and their family are not necessarily related to the supposed threat of sexual harassment when women go out alone in the field, inflicted by 'outsiders', although cases of harassment by male colleagues were reported by female officers. Nor was it reported to relate to the Maoist insurgency (1996-2006) in which some field technicians have been killed (Regmi, 2004). In fact, experiences of actual or 'real' physical dangers were not mentioned in interviews. Security and safety concerns were mainly discussed in relation to cultural norms in the COP of the National Elite – the idea that field work is not considered 'feminine and therefore unacceptable [for women]' (WECS/CIDA, 1991: 24). In short, the terms 'security' and 'safety' obscure social norms and ideals of masculinity and femininity in society which govern the taboo – a point that often is not made explicit in studies on women professionals (Adhikary, 1995; WECS/BCESC, 1996; SaciWaters, 2011). Security and safety concerns primarily refer to the social and sexual reputation of a woman as a person of upper-caste, and connected to that, the honour of the family. As Tamang (2003) points out, *ijjat* – the social and sexual reputation of a woman – is also the currency of men and needs to secured and protected (p.249). Thus, a women engineer travelling 'alone' does not necessarily mean that she goes around individually; it means travelling with 'unfamiliar' men who are not members of the extended family. In case a woman ends up in an embarrassing situation, when she sees men drinking alcohol and dancing late at night or witnesses obscure financial dealings; when she is insulted by a joke or accidently physically exposed during a toilet visit in the open, her dignity is at stake *and* it is explained that male members of the family could not protect 'their women'. In contrast, there is no shame involved in these activities for men, at least much less, and their social reputation is not directly at stake. Men can pee in the open, because no dishonour is involved when somebody sees their genitals (see Annex 35 for a background on the anthropology of toilet visits in Nepal).

Fifth, the aforementioned dynamics also are at play in the DOI and in the COP of the Irrigation Organization, and translate into a strong reluctance among male engineers to work with female engineers at the site.[32] First, substituting the role of male members in the family, senior male officers feel responsible and are held accountable for women's 'security' and 'safety' at work – for her social and sexual reputation. SaciWaters (2011) reports that women engineers tend to describe their relation with male seniors as 'fatherly' or 'brotherly', and a senior officer may see or call junior female staff as 'his daughters' (p.101). The responsibility of 'extra supervision' is perceived by male engineers as an 'additional burden' on their work load, a reason for senior engineers to refuse postings of women in district offices and to refrain from sending women engineers to remote project sites. In contrast, it is perceived that the security and safety of junior male engineers – the social and sexual reputation of young men – is not a concern of seniors. They do not need additional supervision, can be left alone, and are held responsible for their own deeds (see Annex 36 for an illustration of this dynamic based on an excerpt of the workshop). In this context, women engineers in the DOI are treated as a 'second option', because male engineers anticipate that they have to adjust their plans when 'taking' a female colleague to the field (see Annex 37 for an illustration of this perception). Male engineers feel that they can act less flexibly when having to 'supervise' women and also they think that women engineers themselves are not flexibly because they first have to explain and coordinate matters at home.

Another reason why male engineers are reluctant to work with female colleagues in the field is that they have to 'restrain' their behaviour in presence of the other gender and are compelled to watch over their own reputation as good, educated and civilized men of upper-caste (cf. SaciWaters, 2011). One woman engineer of the DOI explained in the workshop about the gossip that occurs when a male engineer 'takes' a female colleague to the field, particularly when it is a young subordinate, causing problems for the reputation of both the man and the woman (see Annex 38). In the presence of educated and upper-caste women, men are supposed to behave, watch their words, control their drinking behaviour and refrain from other 'low' and 'fun' practices like dirty talking, making sex jokes, smoking, dancing,

[32] Adhikary (1995) noted that this is particularly true for the government in Nepal. Women professionals at research and academic organizations, NGOs and INGOs seem to have more challenging jobs, and get more to the field (p.11). She reported that women professionals at NGOs and INGOs in Nepal work up to 100 days per year in the field. However, the definition of 'field' is unclear here, and may mean offices at district level as well.

eating chicken, maasti, playing cards and betting. Men also have to mind their financial dealings after office hours, because women are not expected to act corruptly and engage in these activities (Gupta, 2007; SaciWaters, 2011). Male engineers associate these practices with an informal comradeship in the DOI, but these activities are no longer fun and unremarkable in the presence of women, and they create embarrassing situations *both for male and female engineers*. In this view, ‘women’ are a threat ‘in the field’ for the performance of the Irrigation Engineer. The ambiguities of this dynamic for male and female engineers are aptly illustrated by a discussion in the meeting with women engineers in the DOI (see Annex 39 for a full excerpt). On the one hand, a junior participant explained about her frustration in not being allowed by her senior to sit with her male colleagues after dinner when informal talk started during a four-day field trip. The senior was not prepared to adapt ‘his’ behaviour and wanted to protect her from seeing and hearing improper things, creating a situation that was awkward for her and her male colleagues, and in which the senior himself ended up as ashamed. On the other hand, a junior female engineer explained in the workshop how she felt embarrassed when she did see her senior supervisors dancing late at a national level workshop that she helped organizing. These stories illustrate that the involvement or exclusion of women in informal ‘men’s collectives’ (in the field, at conferences and outings) can produce embarrassing and frustrating situations both for male and female engineers, and are not straightforward cases of ‘getting access’ for women professionals.

Women officers and engineers in the workshop indicated that the taboo on field work is *the* major challenge for making a career, and they elaborated on two coping strategies for dealing with this taboo. One strategy is to pursue field work, taking for granted disapproval from family members and seeking support from (male) colleagues as much as possible. One female engineer explained that she went to a project site in Mustang (a very remote area in the Himalayas) after having given birth to a child, in spite of the disapproval of her in-laws, and of her own mother and sister. This strategy can cost women engineers dearly, mainly because their dignity as a ‘good woman’ is at risk and it only can be pursued when some sort of approval is ‘received’ from family members and peers. The other strategy is to refrain from field work and find meaning in deskwork or jobs that are considered secondary tasks in the organization. In this context, one participant explained that she was ‘unable’ to go to the field after child-birth and was now doing office related work. Women engineers choose to comply to social norms, because they do not want to risk their dignity and the honour of the family, or because they do not want to ‘burden’ their female in-laws with their absence. This strategy also comes at a cost for women engineers, because refusing field work translates into reduced career prospects and in being allocated routine jobs at the office.

The result is thus a catch-22 situation, but what about the ‘role models’ of supposedly ‘more equal’ women in Nepal, like rural women leaders from a non-Hindu background, or

(Western) women expatriates on mission in Nepal? As far as rural women leaders in Nepal with an ethnic background are concerned, they are not considered an example for educated and upper-caste women. They are often portrayed as ‘backward’ and ‘uncivilized’, even though they are said to have a bigger say in the household and for live in general, and are involved in activities that are (sometimes) considered masculine. Limbu and Rai women in the Mechi hills, for instance, control the production of alcohol, drink beer and can be found smoking (Bobbink and Boomstra, 1995). Yet, in this condition, they pose a threat rather than an example for Nepalese female project staff, because meeting ‘drunk women’ can produce a situation of indignity for women of upper-caste (interview with an upper-caste Nepalese WDO officer who worked in the Mechi project, research notes 26-4-2011).

In contrast, Western female expatriates on mission in Nepal are considered a role model for women professionals in Nepal and this is much less abstract than it seems. The role of Western women professionals in regard to educated Nepalese women was extensively discussed in the context of the earlier mentioned PCWR programme (see Chapter 2). An SNV evaluation of 1998 reported that ‘[t]he programme’s idea to send well-educated women to remote areas was very unusual in the Nepalese context and conflicted with the traditional role of [upper-caste] women’, and it remarked that ‘[t]he initiators of the programme felt that it could only succeed if Nepalese women-professionals were supported and in a sense *protected* by the presence of expatriate women’ (emphasis added) (MOFA, 1998: 97). Saliently, also here, the Nepalese woman professional is perceived as an agency-less actor in need of a ‘companion’ for performing her job, in this case female expatriates. Translated to the ‘lady engineer’ in the DOI: in her own capacity, she cannot become an Irrigation Engineer.

5.8 Accumulation of disadvantages and career plateaux

This last part of the chapter presents a summary overview of the challenges that girl students and junior women professionals encounter on the roadway for becoming an Irrigation Engineer, based on the analysis in Chapter 3, 4 and 5. The analysis in Chapter 3 and 4 has shown that Nepalese junior engineers, both men and women, face formidable challenges in the pursuit of engineering studies and a professional career. Limited seats at engineering colleges, strong competition for entry exams, insufficient number of vacancies, particularly for higher management positions, severe competition between employees for attractive postings, no opportunities for training and higher studies, hierarchical working environment, low salaries, and a culture of favouritism and corruption are some of the challenges that were reported by respondents of the questionnaire and interviewed engineers. It is important to note that these ‘general challenges’ also were reported by women engineers as a critical and first set of barriers to overcome (see also WECS/BCESC, 1996; SaciWaters, 2011). This section highlights the ‘additional challenges’ for women engineers and examines under what circumstances, the sum or a combination of the barriers result in career plateaux.

The additional challenges for women engineers come forth out of a reproduction of social inequities at engineering institutions through formal and informal policies and practices (Gupta, 2007). On the roadway for becoming an Irrigation Engineer, subtle – and sometimes not so subtle – disadvantages tend to accumulate along the lines of Merton's (1996) concept of accumulation of advantages and disadvantages, impeding the career of women in science and engineering (see Gupta, 2007, p.509). Eventually, the accumulation of disadvantages produces a deficit of social capital for women, as Gupta calls it (p.524), increasing the risk for a career plateau and being faced with the payment of a substantial 'gender forfeit' in terms of loss of salary or loss of opportunities for career advancement over a working lifetime in comparison to men, as documented for women professionals in the West (Whitehead and Barrett, 2001). In this perspective, Table 5.6 presents a list of 'disadvantages' that pose additional barriers for women professionals to become an Irrigation Engineer. A distinction has been made between formal institutions that impede the career of women professionals, and disadvantages that occur in the informal milieu of the family-society and professional spheres, forming a 'second' set of challenges which women engineers need to overcome.

Table 5.6: Gendered disadvantages on the roadway for becoming an Irrigation Engineer

Space	No.	Type
Formal institutions	1	Limited effect of affirmative action policies and quota
	2	Lack of organisations and unions for women professionals.
	3	Limited maternity leave and no child care arrangements.
	4	Non-functioning resolution arrangements for sexual harassment.
	5	Lack of hostel and toilet facilities in colleges and work places.
Informal milieu	6	Prevailing perceptions and 'her' social reputation.
	7	Lack of encouragement from family and friends.
	8	Responsibilities for household and child caring tasks.
	9	Lack of encouragement from seniors and colleagues.
	10	Heightened visibility and discrimination against women in engineering.
	11	No access to informal 'men's collectives'/ Maintenance of social decorum.
	12	Being ignored, considered inferior or treated as a 'second option'.
	13	Intimidation, scolding and sexual harassment in colleges and work places.
	14	Falling prey to departmental tactics.
	15	Taboo on field work for women professionals/ Lack of experience.
	16	Developing masculine desire without losing femininity.

By all means, Table 5.6 does not present a conclusive list of disadvantages. On the one hand, all disadvantages, per definition, are interrelated and can thus be grouped into less categories. For instance, the lack of encouragement from family and friends to pursue an engineering career (no.7) is related to the perceived responsibilities of women for household and child care (no.8), and the cultural taboo on travelling and field work for women (no.15). On the other hand, many more disadvantages can be specified. For instance, heightened visibility and discrimination against women in engineering (no.10) is a generic category, including the practice that women are seen as tokens in the organisation and prejudices like the perception that women get things done easily because of their sex. The disadvantages as mentioned by respondents or as found in literature are briefly discussed below. Generally, the list in Table 5.6 bears resemblance to findings in the work of Adhikary (1995) on women graduates in Nepal. Her study can be consulted for a (historical) comparison (see p.30-35).

5.8.1 A summary overview of gendered disadvantages

1. Limited effect of affirmative action policies and quota: Gender and caste discrimination was abolished in 1963 and public affirmative action policies for recruitment at engineering colleges have existed since the 1970s. In the 1990s, the first scholarships targeting women were introduced (by donors) (Adhikary, 1995). Nowadays, measures also address 'other' social inequities, targeting students from remote areas and public schools, or with a low caste and ethnic background – issues that were previously ignored. The same trend is visible in the recruitment of public servants. The civil service reforms of 1998 raised the upper age limit for women to join the civil service to 40 years whereas it remained 35 years for men, shortened the probation time for women to 6 months whereas it remained one year for men, and made female civil servants eligible for promotion one year ahead of the scheduled provision for promotion. In addition, in 2007, an elaborate quota system was introduced for the recruitment of government staff, 40% of the new posts are to be filled by 'disadvantaged' groups like women, Janajati, Madhesi, Dalit, disabled people and residents of backward areas. The effect of these policies has been limited, sometimes they have been half-heartedly implemented; quota uptake is low and scholarships for education are few (Udas, 2011) (see also Chapter 2).

2. Lack of organisations and unions for women professionals: Alumni and professional engineering associations are accessible for women as engineers, but they are exclusively controlled by men and they focus on mainstream professional issues. The incipient networks of women professionals that exist in Nepal are related to (short-term) foreign initiatives and support (see Chapter 3). There is no bottom-up organisation of 'sisterhood' among women professionals in Nepal, contributing to the invisibility of women engineers (cf. Udas, 2011).

3. Limited maternity leave and no child care arrangements: Civil service regulations allow a maternity leave of 60 days for women, as well as unpaid leave arrangements for extended periods of time, both for male and female officers (Udas, 2011).[33] However, the period of

[33] Colleges were not reported to have maternity or unpaid leave arrangements and child care facilities for students. Pregnant (and married) women students are an exception, particularly at diploma and bachelor level.

maternity leave is not counted as job experience in performance evaluations and generally, officers are reluctant to take up unpaid leave, because they risk opportunities for promotion or being allocated an unattractive posting. No cases were reported of male DOI engineers taking up leave for baby care and female DOI engineers seek to manage alternative feeding arrangements after maternity leave. At most public offices, including those of the DOI, there are no special provisions or child care facilities.

4. Non-functioning resolution arrangements for sexual harassment: Engineering colleges and the civil service have codes of conduct and policies for dealing with cases of sexual harassment. Officially, cases are dealt with by the college authorities or by a public service complaint commission, and as an ultimate penalty, a student or public servant can be expelled from the college or the civil service respectively. In practice however, the problem is underestimated by higher management and remains invisible for outsiders as cases of sexual harassment do not get reported (cf. SaciWaters, 2011). Workshop participants did not feel to be in a position to 'complain' and press higher management to take action (see also no.13).

5. Lack of hostel and toilet facilities in colleges and work places: Until recently, many engineering colleges did not have hostel and sanitation facilities for women students, although this has now changed at most education institutions for engineering. Likewise, district offices of the government do not always have proper and separate lodges for female officers, even though most offices of the DOI now have (basic) toilet facilities for men and women (Udas, 2011). *In the presence of men*, the lack of lodging and toilet facilities raises practical issues which women need to address in an effort to maintain their dignity and social decorum: where to sleep, go to the toilet and take care of personal hygiene?

6. Prevailing perceptions and 'her' social reputation: An emphasis on female chastity in the COP of the National Elite translates into views that women are 'incapable' to travel or stay overnight in the field, and are not expected to bribe and act corrupt (compare Gupta, 2007 for India). An engineering career is seen to compromise her dignity and the honour of the family. These perceptions translate into a stereotype of engineers as men and in discriminatory practices in colleges and work places. The presence of women in engineering colleges (nowadays 15%) is mainly perceived as a strategy to create prospects for marriage, supported by a publicly subsidized (and cheap) fee structure for higher education (Udas, 2011). In the DOI, women officers and engineers are discriminated as 'lady engineers' (see also no.10).

7. Lack of encouragement from family and friends: Girls in high-class, upper-caste families are generally supported by their parents in higher education, including in engineering studies, with the objective to secure marriage prospects or earn an additional income for the family. However, her first 'destiny' is getting married, raise a family, support her husband, and preserve her dignity and honour of her (new) family – a system which historically has served to control female sexuality as Gupta (2007) argues for India. Mothers-in-law and sisters-in-law, as well as female members of the parent family, play a critical role here; they put strong pressure on married women to act as mothers, pure and chaste, and take up their responsibilities in the family sphere (see also no. 6 and 8) (see also WECS/BCESC, 1996).

8. Responsibilities for household and child caring tasks: Married women of high-class and upper-caste are expected to take up household tasks, and care for the elderly and children, or supervise servants for the job. The dual responsibility of women professionals in the family and professional spheres causes time constraints and makes it difficult for them to accept positions which entail periods out of touch in remote places. The problem becomes more serious for women who have small children and whose spouse also are in service. Women in the workshop also reported that it was difficult for them to hang around after office hours with colleagues, due to family obligations.

9. Lack of encouragement from seniors and colleagues: The socio-cultural (Hindu) norms in society are also at play in the professional sphere. In the DOI, there is considered nothing irrational in inaugurating office rooms or structures on an auspicious day or in accepting caste inequalities (own observation). Seniors and male colleagues in the DOI are reluctant to work with female engineers, because of the perceived ‘extra supervision’ and ‘additional burden’ on their work load, Women engineers in the workshop reported that men in the DOI cultivate an indifference towards concerns of women and they lack encouragement.

10. Heightened visibility and discrimination against women in engineering: Women students and engineers function as tokens in colleges and in the DOI. In colleges, their low number makes it inevitable that they require the help of men to discuss or clear doubts, while this is not true the other way around (compare Gupta, 2007 for India). As tokens in the DOI (‘lady engineers’), women face the consequences of maintaining decorum – not men. Women have to do better than men to get professional recognition; women are expected to be perfect; men have lower expectations of women; men perceive that women have significantly higher access to cooperation from (male) teachers, clerks, colleagues and seniors; and there is the perception that women get things done because of their sex (cf. Parikh and Sukhatme, 2004; Gupta, 2007; SaciWaters, 2011). In this context, men are often reluctant to give women the credit for meritorious work.[34] These arguments can take many shapes and remain relatively invisible for outsiders, because prejudices and favouritism will always be denied: it would mean for men to admit that they benefit from discrimination in the organisation.

[34] Gupta (2007) notes that these perceptions may also be based on class antagonism as most women professionals are from higher class families. This is also true for Nepal (see Chapter 4).

11. Limited access to informal ‘men’s collectives’/ Maintenance of social decorum: Women engineers reported to have limited access to informal ‘men’s collectives’. On the one hand, women walk away when informal talk starts between men in the office or in the field, because they want to preserve their dignity and social reputation. On the other hand, the heightened visibility of women leads to boundary maintenance among men. A lack of informal interaction, contacts and networking is a serious problem for women engineers, contributing to their invisibility in the irrigation profession. Reduced informal interaction results in a negative impact on the level of confidence (unable to ‘break the ice’ or to ‘build rapport’), leading to isolation from the wider social network.

12. Being ignored, considered inferior or treated as a ‘second option’: The prevailing perceptions in society (see no.6) and the heightened visibility of women (see no.10), translate into a situation in which women are awarded a low status in the organisational hierarchy of the DOI. Senior officers are addressed by sir or ma’m – and (junior) women are at the receiving end. It translates into a persistent belief in women’s intellectual inferiority and women’s incapability to travel to the field. The result is that women are ignored or treated as subordinates – and not just because women engineers in the DOI are mostly juniors.

13. Intimidation, scolding and sexual harassment in colleges and work places: Women officers and engineers in the DOI talked about ‘direct’ and ‘indirect’ forms of harassment, i.e. intimidation and scolding as well as physical forms of sexual harassment. In this respect, male colleagues pose the biggest threat for women officers, and engineers in the DOI and the greatest risk for ‘their’ security, safety and dignity. Women are reluctant to report harassment to (male) seniors because it may imply they have loose morals.

14. Falling prey to departmental tactics: As a result of a lack of informal interaction, contacts and networking (see no.11), and their low status in the organisation (see no.12), women engineers fall prey to departmental tactics (cf. SaciWaters, 2011). In the DOI, office resources, opportunities for field work, attractive postings and chances for promotion are subject to competition among staff. In this context, women are isolated due to petty politics, favouritism by supervisors or shared interests among men, and women engineers constantly have to act vigilantly to secure opportunities or prevent being selected for unattractive jobs.

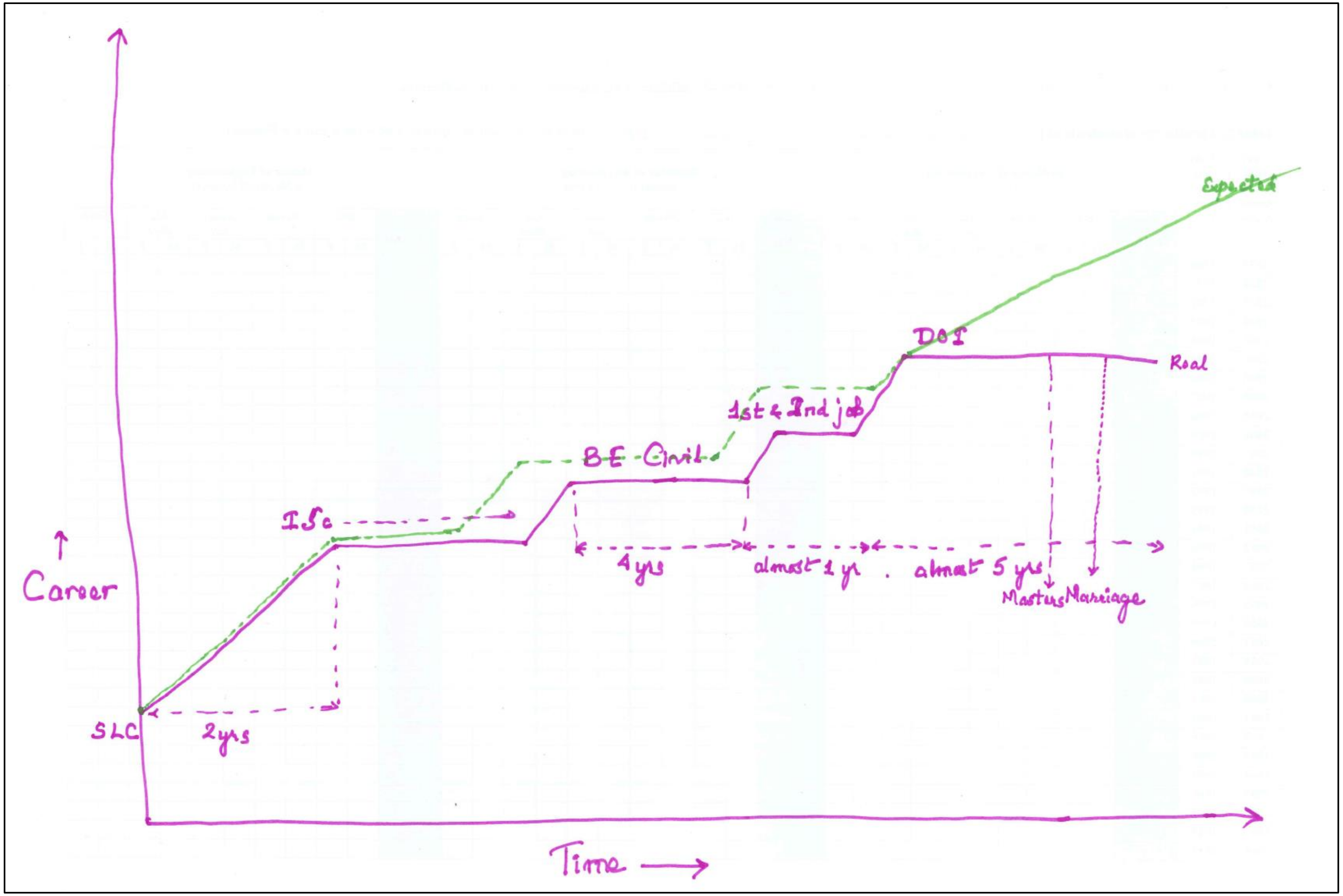
15.Taboo on field work for women professionals and lack of experience: Educated women, particularly married women, are not expected to undertake field and stay away from home (see no.6). The taboo on field work for women is cultivated in the family sphere (see no.7) and in the professional sphere (see no.9). The taboo constitutes a major problem for them, because it produces a lack of experience in comparison with male engineers.

16. Developing masculine desire without losing femininity: For women engineers, there is a tension between developing ‘masculine’ desire and passions like their male colleagues, and performing femininity as a woman of high-caste, pure and chaste. For becoming an Irrigation Engineer, girl students and women engineers are expected to behave the same as their male peers, and find meaning in construction projects and develop a passion for field work – the ‘hardware’ activities. At the same time, women engineers are denied opportunities or are reluctant to act like men, because it is not considered feminine, and they often see no other option than to find meaning in secondary tasks in the organisation, such as training of farmers, desk design of structures, paper work and cooperation with other departments – the ‘software’ activities (Udas, 2011). Software activities may allow to preserve dignity and meet family obligations, but they do not provide for a roadway to become an Irrigation Engineer. The lack of female role models in the DOI, to contest the normative male career, is an issue here.

5.8.2 Plateaux in careers and ‘exclusion’ of women engineers in the DOI

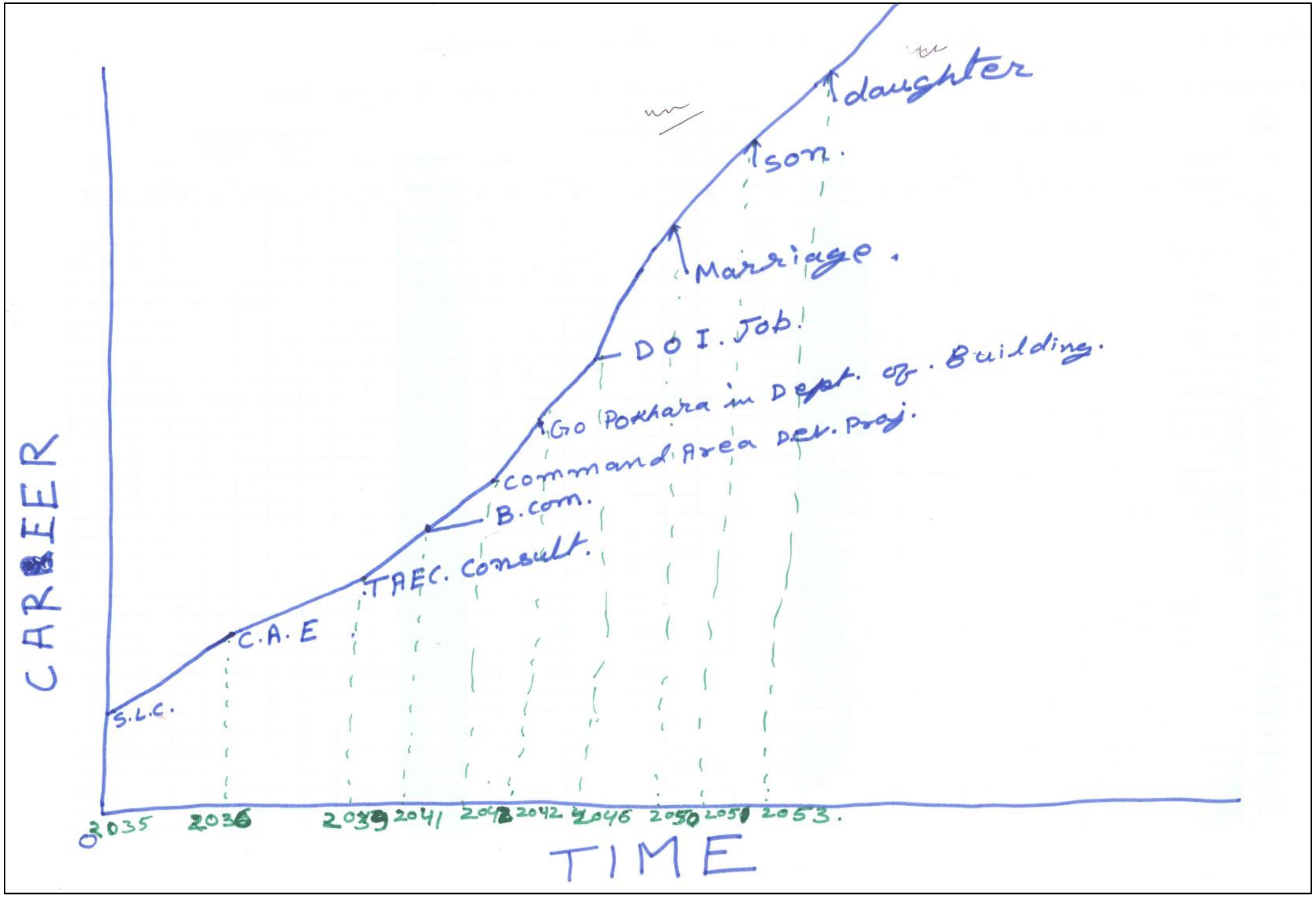
The sum or a combination of disadvantages results in career plateaux for women engineers. The question of career plateaux is an important one, because it can reveal how masculinities are sustained in the DOI by denying women water professionals the status of membership in the COP of the Irrigation Organisation. The idea of a career plateau (or glass ceiling) was introduced in the workshop, but not all participants talked about it freely. As noted, there was a division between junior and senior female officers. The first group talked freely about difficulties in the working environment of the DOI, but they were not prepared to believe or had not yet experienced, that these difficulties mainly related to gender and would potentially result in career plateaux. The second and senior group of women engineers were clearly aware of this and displayed a more seasoned attitude to the question, discussing the issue seemingly relaxed and consciously. In an effort to engage both groups of engineers, participants were requested to make a drawing of an ideal career path and their actual career path – indicating memorable events – and these drawings were discussed in the workshop. The drawing of Mrs. Maharjan (see Figure 5.2) represents the career path of a woman engineer at the beginning of her career, after around 5 years of employment in the DOI, starting with a bachelor civil engineering (BE Civil). The drawing of Mrs. Shrestha (see Figure 5.3) shows a career path of a senior woman architect (and engineer) after more than 10 years of service. She started her career as an officer with a certificate of architectural engineering (CAE). Admittedly, not all women were confident to make a graph. Some did not have a view of an ideal career path, as there were hardly female role models at higher management positions in the DOI, and others felt that they were following the only or best career path that was possible for them.

Figure 5.2: Career path exercise of Mrs. Maharjan



Source: Workshop

Figure 5.3: Career path exercise of Mrs. Shrestha



Source: Workshop

That having been said, the graphs clearly indicate two major plateaux in the career of women engineers and these are the same as found in literature for South Asia (Adhikary, 1995; Parikh *et al.*, 2003; Parikh and Sukhatme, 2004; Gupta, 2007; SaciWaters, 2011; Nair, 2012). The first plateau is that women engineers are unable or unwilling to pursue a career after college graduation at the stage that a junior engineer actually needs to assume employment. The second plateau is that women engineers are unwilling or unable to pursue the ideal career path of an engineer upon marriage and child birth. The women engineers commented that these moments often coincide – girls graduate from engineering college, get married, bear children, never assume service and lack experience – leading to a 'double plateau' in their career. Figure 5.2 shows that Mrs. Maharjan got through her education at the engineering college, was successful in obtaining jobs and a position in the DOI (the top and bottom line in the graph follow neatly), but has experienced a career plateau soon after she was employed by the DOI (see the split in lines marked by the abbreviation 'DOI'). The graph also indicates (see the bottom line representing the real career path) that Mrs. Maharjan got married at roughly the same time. The same dynamic is visible in Figure 5.3, the career path of Mrs. Shrestha (the years between 2035 and 2053 BS cover the years between 1978 and 1996 AD). This graph shows only one line as career path, but it clearly reveals that at a given point in time, her 'DOI job' resolves around marriage and the birth of a son and daughter. Also here a plateau can be assumed, because no (other) significant job achievements are mentioned.

Participants explained that the common denominator in the career plateau is *the issue of travelling to the field and cooperation with colleagues at the site*. As noted, the opportunity to participate in field work and be part of a team of engineers is *critical* for becoming an Irrigation Engineer, and a failure to do so results in career plateaux. Female engineers may thus get through engineering education relatively easy, ending up equally qualified as male engineers, but problems arise during employment in the DOI when a 'gap' is created between the practical experience of male and female engineers. In this context, one junior participant explained that she has experienced a 'discriminating distance' between her male peers and herself in the DOI (see Annex 40 for a full excerpt of the discussion). The graphs also illustrate that the career paths of male engineers, consciously or otherwise, function as ideal or normative models for professional and personal development. This is perhaps the strongest indication of masculinities in the DOI – the norm is what male engineers do in the profession. Not surprisingly, most employed women technicians and engineers in Nepal 'end up' working in research and in teaching, a job that does not require field work and is often located in the city (Adhikary, 1995; WECS/BCESC, 1996; Udas, 2011).

5.9 Conclusions

This chapter has presented a concluding analysis on the roadway for becoming an Irrigation Engineer. The focus has been on the position of girl students at engineering colleges and women engineers in the DOI, based on the observation that the absence of women professionals in irrigation is the most visible marker of 'masculinity' in the COP of the Irrigation Organization in Nepal. The analysis in this chapter suggests that women officers and engineers in the DOI experience discrimination, *because* it is 'their' absence that critically defines the masculinity of irrigation engineering. In the DOI and in the COP of the Irrigation Organisation at large, the 'lady engineer' appears to represent 'failure as a socially arranged social identity' in the words of Lave (1996: 16), and women students who 'fail to learn' to become an Irrigation Engineer seem to function as 'the sacrificial lambs whose fates give material form to legitimate knowledge [in irrigation engineering]' to quote Lave (1996: 11) one more time. It has been shown in this chapter that practices of exclusion take many shapes, are actively cultivated and are unlikely to disappear. Women face an exceptionally difficult situation in making a career in the DOI, regardless of the qualifications they have and the good work they do. The low number of women water professionals employed across water agencies in South Asia (SaciWaters, 2011), in spite of an increased enrolment and graduation of talented girls at engineering colleges, suggests that emancipation and gender equity are not (always) trickledown effects of education, progress and modernization – an assumption that is shared by engineers and water professionals in the West and in Nepal – and used occasionally to argue against the implementation of affirmative action policies.

Three narratives of inequity have been exposed in this chapter. The first narrative is that the (irrigation) engineering profession has no longer the social status for elite men that it had before, and is now also a profession considered suitable for girls (Nair, 2012). This has been a result of globalisation and market forces – not an effect of quota and affirmative action policies. Engineering education is now (more) widely available in Nepal and has become relatively cheap at public colleges. The decline of status (and pay) stands in direct relation with the entry of girl students in engineering, a process which can be dubbed the 'feminization of engineering'. In this perspective, the performance of the Irrigation Engineer, as it once existed will soon be something of the past. The feminization of engineering does not necessarily imply that water resources development will become less masculine. Women entering engineering in South Asia is a process of changing horizontal segregation (Nair, 2012), and Gupta (2007) notes that a greater participation of women in science education and engineering does *not* lead to lesser gender stratification in occupations (p.512). In other words, performances of the Irrigation Engineer and other water specialists may also become 'more masculine' in a process of carving out a professional identity amidst 'other' male and female professionals. Indeed, the stereotypes among men in engineering, like those of the 'engineer' and 'lady engineer' in the DOI, represent the failure of engineering to fight for social and intellectual transformation (Gupta, 2007: 518), and they suggest that the irrigation profession in Nepal is changing and becoming differently masculine.

The second narrative is that women engineers cannot, or are not entitled to perform like an Irrigation Engineer. Women engineers in the DOI have the status of 'lady engineers' and that is something else than being an Irrigation Engineer. The stereotype of the lady engineer is not just the result of men denying women opportunities to make a career, but it is a performance that requires considerable agency of women professionals themselves. Many women engineers are not prepared to risk their dignity and the honour of the family in practices that are implicated in the performance of the Irrigation Engineer, such as going to the field or working in a team of engineers with men only. They desire to adhere to the norm of a 'good' or 'normative woman' – educated, urban and upper-caste – and they want to preserve their social reputation, which implies practices like not crossing 'the limits', not being loud, not being too frank and free with male staff, being decent and properly dressed (sari or salwar kurta), and not ending up in embarrassing situations (SaciWaters, 2011). The stereotype of the lady engineer is highly problematic for women engineers in the DOI, because it puts them in a subject position in which they constantly need to prove and explain that they are capable professionals. It can be considered a double subjectivation: the stereotype of the lady engineer provides for an identity to make a woman engineer self-conscious as a professional, empowering her to act, but it also secures her subordination in the masculine culture of the DOI. This explains why it is seen occasionally that '[s]ometimes the woman herself is an obstacle in her growth' (SaciWaters, 2011: 85) – as if making a career in the DOI is not a balancing act for women but primarily a matter of individual willpower.

The third narrative is that women engineers who are prepared to take risks and really try to perform like an Irrigation Engineer, face the prospect of losing their dignity and feminine status with all negative consequences attached. The identity of the Irrigation Engineer is constructed through alterity, a process of identity formation that occurs through 'othering', marking groups as different and excluded (Whitehead and Barrett, 2001). In other words, the status and identity of the Irrigation Engineer is importantly defined by what it is not – the performance of lady engineers. In a situation in which women aspire to perform like an Irrigation Engineer, a crisis tendency is destined to emerge (Connell, 2005 [1995]), particularly for men who identify themselves as Irrigation Engineers. The most effective way to protect their status and identity, and the associated material access to resources, career opportunities and promotions, is to degrade the women professional as a woman. For this purpose, the repertoire of discriminatory practices is almost infinite within a male-dominated environment like the DOI. For instance, the femininity of a woman engineer can be questioned through gossiping that she is a woman of loose morals who works with men only or by harassing her more directly or more subtle by continuing practices of dirty talk, drinking and smoking when she enters a group of male colleagues, causing an embarrassing situation for her and making her part of it. The result is that her social reputation is discredited, making her life very difficult, and that a culture of masculinity among men is re-established.

In all the three narratives, the space for women to act as 'agents of change' or 'gender benders' – the liberal and progressive ideal of many feminist and pro-feminist development practitioners and academia – is limited. This appears partially related to the fact that male and female engineers in DOI reflect on their practice and profession, but not necessarily on the 'masculinity' of the profession, echoing a trend in reflexive writings on the position of the engineer in development (see Robbins, 2007 for instance). As noted, male and female engineers in the DOI are aware of a normative professional culture in the organization. When asked through questionnaires or open questions, they answered with detailed descriptions. Male and female officers in the DOI can also be seen to reflect on prevailing gender patterns in the organization. They know that the DOI is numerically dominated by men, they described typical male and female roles in the organization, and they were not reluctant to admit that they behaved differently towards a colleague with a different gender. However, engineers in the DOI do not qualify the prevailing culture in the organization and the associated gender patterns as 'masculine'. More specifically, both male and female engineers do not see the DOI as a 'more' male-dominated institution than other organisations in society, and they perceive the issue of masculinity, as practiced in Nepalese society, as totally unrelated to the profession of civil engineering and the goals of the department. When asked explicitly in the workshop, female engineers gave definitions of masculinity, but these definitions were unrelated to the profession of irrigation engineering. Like their male counterparts, they have internalized a strong conviction that science and engineering is rational and universal, and it is not uncommon to hear women engineers argue for 'gender neutrality', meaning to say that 'gender should not come into [irrigation] organisations' (SaciWaters, 2011).

Generally, it can thus be concluded that male and female engineers in the DOI do not display a deeper awareness on how the cultivation of desire and passions in irrigation engineering – the aspiration to build projects based on principles of water use efficiency and the ambition to talk with farmers on irrigation and project matters – structures the agency of individuals to perform into a professional environment that has strong masculine connotations. In short, male and female engineers in the DOI and with them, many other members in the COP of the Irrigation Organisation, do not seem to reflect on the idea that masculinities 'stick' to the Irrigation Engineer, because the knowledge of the Irrigation Engineer 'itself' has strong masculine connotations. This idea – the gendered thinking in irrigation knowledge – forms an entry point of analysis that is taken up in the remaining part of this book.

To conclude these three chapters on a (more) optimistic note, the normativity (and masculinity) of the roadway for becoming an Irrigation Engineer is most likely to change through critical mass. The subjectivation of women professionals in irrigation engineering is likely to produce less paradoxical situations when the norm is no longer what men do but also what women do. For instance, Parikh and Sukhatme (2004) argue that women engineers in science and engineering institutions in India are treated with mistrust and suspicion because there are no women in selection boards. This is most likely to change when women are in selection boards. A study for corporate boards in the West found that a critical mass of 3 female members out of 10 positions in selection boards of management committees, was sufficient for an 'gender-unbiased' selection of candidates (Kramer *et al*., 2006). This would imply to advocate for a quota of 30% women (or more) in college and civil service recruitment in order 'to make' engineering cultures change. As noted, calls to increase the quota from 10% to 30% for girls at engineering colleges and an introduction of a 30% women quota for the civil service have been aired in Nepal, but never made it (see the report of WECS/BCESC, 1996). Currently, the quota in Nepal are below the requirement for critical mass: 10% girls at engineering colleges and 13% women for the civil service. That having been said, it is not all about numbers (and about quota to achieve better numbers). Critical mass may change a working culture, but it is not a guarantee for changing masculinities or for a more responsive organisation. Gupta (2007) has documented for IITs in India that an increase of girl students at chemistry departments helps women to create their own groups, leading to more interaction and discussion, but not necessarily *between* men and women. Also a higher number of women students does not necessarily lead to a bigger group, because girls get divided over laboratories – a phenomenon that has been dubbed the 'paradox of critical mass' (Etzkowitz *et al*., 1994). In short, an agency with large groups of women can also be masculine, hierarchical and unresponsive.

Chapter 6:

The performativity of data and policy in Nepal on irrigation[35]

6.1 Introduction

This chapter examines the performativity of data and policy in Nepal on irrigation. The objective is to explore how gender and masculinities might be implicated in the production of irrigation knowledge and water expert thinking. In addition to Chapter 7, it analyses how technical representations of reality – data and statistics in policy – help to enact professional credibility and claims of truths of engineers and state planners. The focus is on the performativity of state irrigation development in Nepal and the role of the COP of the Irrigation Organisation. As noted, key actors in the COP of the Irrigation Organisation are the technical agencies of the state, mainly the DOI and the MOWR (or the MOI as it is known since 2009), the formal agencies of donor groups, notably the WB and ADB, and also private sector agents like engineering consultancy firms and contractors (see Chapter 1 and 2). For understanding the meaning and value of irrigation knowledge, there are two great views of method in science and social science (Latour and Woolgar, 1986; Law, 2009). One view is that methods, such as the production of data on irrigation for policy making, are techniques for describing reality. This approach represents the received wisdom and is based on the assumption that reality has a definite form that is independent of the tools that are used to measure or count it. This view is dominant among irrigation professionals. It sees data or other forms of knowledge as a description of the 'factual' status of irrigation in Nepal as best may be, and 'inconsistencies' in the data are treated as the result of a lack of methodological rigour. Another view is that methods do not simply describe realities, but also enact these into existence (Callon, 2007; Behagel, 2012). This approach is based on the idea that methods, like presentations of data in irrigation statistics, aside from describing realities also take on a life of their own, generating and enacting new realities. This view considers knowledge practices, like the collection of data on irrigation, as performative (Law, 2009).

In this chapter I explore the performative approach in the context of the production of data in Nepal for irrigation policy making. Understanding data collection as a performative practice is also a minority view among other foreign and national members in the COP of the Irrigation Organisation – engineers, planners, administrators, loan officers, consultants, researchers and other professionals – because it complicates the meaning and value of the

[35] Sections of this chapter have been published in Liebrand (2010) 'Masculinities: A scale challenge in irrigation governance' and Zwarteveen and Liebrand (forthcoming, expected in 2015) 'Performing modernity: The scalar politics of irrigation development in Nepal'. See reference list for full details.

'facts' in policy making (Mosse, 2005). However, in a study on gendered thinking in knowledge, taking for granted the presentation of data and statistics on irrigation is not an option, because that would leave unquestioned the supposedly neutral position of 'men' as engineers and irrigation professionals in the production of irrigation knowledge. I deal with this by considering presentations of data in policy as performance, as a 'cultural expression' of state irrigation development – or what also can be seen as the habitus of state irrigation development – and by seeing the numbers on irrigation as a 'show' that exemplifies hierarchies of knowledge, power *and gender*. As facts, numbers on irrigation development reveal the state of art in the sector and they are used by professionals as a starting point for research, policy and planning. In this form, irrigation data can be considered to form one of the most high-profile character traits of professionalism in irrigation governance. Paradoxically, however, irrigation data are rarely considered as a 'show' of professional performance, because the ideals and habits in the production of data are embedded in a culture of engineering and the scientifically framed instrumentalism of state led development (Scott, 1998; Suhardiman and Mollinga, 2012).

The perspective that data and policy on irrigation can (also) be seen as cultural agents that enact professional identities – and (some of) the masculinities associated with those professional identities – is controversial. The construction and presentation of data in statistics and policy is a complex process, being shaped and influenced by diverse factors like scientific norms, international professional conventions, administrative requirements, government legislation, the need for monitoring and project completion, and practices like policy formulation – to name a few. Some of the complexities of this process are reflected in the 'evolution' of irrigation statistics in Nepal, which is briefly discussed below. To say then that data on irrigation are (also) a cultural expression of professional performance, through which irrigation professionals have credible voices and identities for themselves, is not an easy idea to digest. It suggests that the construction and presentation of data on irrigation is partially a non-rational process, leading its own life and 'doing things' that we do not fully grasp. It implies that there is something 'cultural' in the 'cultivation' of irrigation data. Controversial as may be, the idea is not new. Following Mosse (2004; 2005), the COP of the Irrigation Organisation has been defined in Chapter 1 as a coherent learning environment and 'interpretative community' of a diverse group of professionals and policy elites that pursue a multiplicity of interests and who participate in the established order and presentation of knowledge. Mosse suggests – as I interpret his work – that the presentation of data in development and the task of policy (re)modelling is importantly an outcome of habits, customs and particular beliefs among a diverse group of professionals, embedded in the need to maintain relationships (see also Rap, 2007). If that is true, it is a small step to conceptualize that the cultivation of irrigation data may also be embedded in a need to maintain gendered relationships and masculinities in the COP of the Irrigation Organisation.

The analysis relies on the following data sets and irrigation policy documents in Nepal:

- The first '**Master Plan of Irrigation Development in Nepal**' of 1970. A policy plan for 1970-1990 of the then MOWR under the then His Majesty's Government of Nepal. The plan is quoted in this book as 'HMG-N, 1970b'.
- The '**Database for Irrigation Development**' (DBID) in Nepal of 2007. A database developed and up-dated by consultants of the Centre for Engineering Research and Development (CERD), contracted by the DOI to do the job. This document is referred to as the 'DBID database' and quoted as 'DOI/CERD, 2007'.
- The '**Irrigated Agriculture and Water Resources Assessment Report**' of 2012. A document written by (international) consultants of the ADB, prepared as input for a new country 'Agricultural Development Strategy' of the ADB for Nepal in the coming years (up to 2030). This report is quoted as 'ADB, 2012a'.
- The section in the '**Agricultural Census**' of 2001 on irrigation. The agricultural census is executed by the Central Bureau of Statistics (CBS) of the Government of Nepal. This database is quoted as 'CBS, 2006'.

The details and background of these documents, and the rational for selection, is discussed below. Here it suffices to say that these data and policy documents can be seen to bring into existence varies realities of irrigation development in Nepal, at different times and for different purposes (e.g. monitoring, planning, research), reflecting the mainstream experience – in Victor Turner's words – of state irrigation development in Nepal in the past 40 years.

The analytical approach in this chapter is based on the performative capacity of irrigation data and policy, and a comparison of 'performances'. I have also applied this method in the analysis and interpretation of the questionnaire on irrigation professionalism (see Chapter 4). Here I elaborate on this method by bringing in 'more' performances to create contrasts and counter knowledges for comparison. Again the idea is quite simple. If the presentation of data and policy is capable to bring into existence a reality, then it also is theoretically possible to bring into existence an 'alternative' reality. This could be done by 'reworking' the numbers. This can be considered as a sound research method, because the reworking of numbers is not an uncommon practice in (mainstream) policy making, often seen as a necessary and logical outcome of changing insights and shifting administrative priorities (as well as many other factors). It could also be done by deconstructing the 'reality' that irrigation data and policy bring into existence. There is a commendable body of literature available in Nepal on irrigation that aims to document 'realities' as experienced by farmers. These two methods are put to the test in this chapter. By using literature on farmer irrigation in Nepal, the performativity of irrigation databases and policies can be deconstructed – 'what they do' – and by reworking the numbers of the datasets, it also can be revealed 'for whom' they do it.

For clarification, my intention is *not* to argue that contemporary databases and policies in Nepal on irrigation are false or particularly flawed. Nor do I want to argue that the use of data in irrigation for policy purposes is useless all together. I am also keen to stay away from Ferguson's argument on the 'anti-politics machine' in development which portrays the use of data and policy as a strategic, technocratic practice that reduces 'poverty' to a 'technical problem' (Ferguson, 1990; Ferguson and Lohmann, 1994; see also Wilson, 2006). To iterate, the question of true/false, inconsistencies/gaps and the politics 'behind' irrigation data and policy is *not* a subject of study here. Any representation of knowledge generates silences and paradoxes – also this chapter – and I prefer to assume that irrigation data in policy reflect genuine efforts of professionals to capture reality as consistently as possible. My interest lies in the performativity of irrigation knowledge, to invoke reflections on the gendered thinking and knowledge production in irrigation, based on the assumption that irrigation professionals have only a 'liminal awareness' of the things that irrigation databases and policies (also) do. To clarify, Martin (2001) defines liminal awareness as less than full consciousness in her research on men and mobilizing masculinities at work.

The chapter is divided in three parts. First, I explore the plausibility of seeing irrigation data and policy as a show of state irrigation development and I bring out the reality that the data help to bring into existence. Second, I deconstruct the reality that is enacted by irrigation data and policy to see what they do, and third, I rework the numbers of the datasets to bring out an alternative performance and to see whose desire (and identities) they help to enact.

6.2 The performativity of state irrigation development in Nepal

When defining state irrigation development as performative, it means that irrigation data and policy have the capacity to *reflect* and *structure* the experience of members in the COP of the Irrigation Organisation (Turner, 1969; 1974; Turner and Bruner, 1986; John, 2008), or to *describe* and *enact* a reality in the words of Law (2009). To recall, 'experience' or 'lived experience' for Turner, as thought and desire, as word and image, is the primary reality of individuals (Turner and Bruner, 1986: 5). In the perspective of Turner, experience is not equivalent to the more familiar concept of behaviour. The latter implies an external observer describing someone else's behaviour and it presupposes the existence of a reality out-there, 'behind' experience. For Turner, the distinction between reality, experience and expression was irrelevant, because whatever reality may be cannot be perceived independent of experience and expressions. As I interpret his work, he implicitly questioned the existence of one, uniform reality, much like Butler (1999 [1990]) and Law (2009) would later do more explicitly. In the words of Turner and Bruner (1986), '[w]e can have an experience but we cannot have a behaviour (...). The distinguishing criterion is that the communication of experience tends to be *self-referential*' (emphasis added) (p.5). In short, experience refers to an active self, to a person who not only engages in but shapes an action or practice.[36]

Translated to the practice of irrigation knowledge, it means that the production and presentation of data in irrigation policy can (also) be considered the product of a stylized repetition of acts among irrigation professionals, simultaneously disciplining and producing subjects (Butler, 1999 [1990]), or in the words of Schechner (2006 [2002]), the outcome of ritual or restored behaviour of members in the COP of the Irrigation Organisation. The (ritual) process of experience can be considered as follows: the presentation of data in irrigation policy is based on (liminal) desire, particular beliefs and preconceived ideas on whatever is considered real or important (reflection or description), and such a presentation in turn, expresses and reproduces whatever is then considered real and important (structure or enact). In this view, presentations of irrigation knowledge read as self-referential professional performances, embodying an expression of ideas and identities that is given meaning in data in policy within an experience that is marked by an hypothetical past and anticipated future. If this is true, it follows that irrigation data in policy can be understood as an expression of individual, self-referential professional identities in irrigation.

When acknowledging the performativity of irrigation knowledge, it allows to conceptualize the social construction of irrigation data in policy as a process of 'culture in the making' (see Chapter 1). Theoretically, it implies that irrigation data in policy can reveal, through an exercise of critical reading, how (some of the) aspects of the gendered professional culture and identities in the COP of the Irrigation Organisation are reproduced and enacted in the use of irrigation knowledge. Through an analysis of the context and purposes of the writing, and through an examination of the analytical dimensions used in irrigation data and the type of evidence presented in tables, it is possible to understand some of the professional dispositions, habituated practices and the desires (habitus) that members in the COP of the Irrigation acquire and reproduce through the use of irrigation data in policy, and to analyse how this process sustains gender hierarchies and masculinities in irrigation knowledge production.

To recall, in an analyse of the performativity of state irrigation development, it is important to keep in mind that the technical and cultural dimensions of professional performance mutually constitute each other, inseparably and simultaneously (see Chapter 1). This also is the case in

[36] Abrahams (1986) deliberated on different meanings of 'an experience'. On the one hand, Turner understood 'an experience' as the flow of everyday or ordinary experiences, as something that is reportable for individuals, and on the other, Turner understood 'an experience' as a large-scale or extraordinary experience in which individuals recognize over period of time that the pattern of our activities is part of a much larger story, one that began before we were born and will continue after death. I take note of these deliberations and when I use the term 'an experience' in the main text, I assume it captures both ordinary and extraordinary experience.

the use of irrigation data and I acknowledge that irrigation data in policy are importantly shaped by diverse 'technical criteria' (see above). However, the focus in this chapter is almost exclusively on the cultural performance of irrigation data in policy, as exemplified by the theoretical deliberations above, and I take the technical performance of irrigation data in policy for a moment for granted. I consider this a necessary step to explore how the use and presentation of irrigation data sustains and supports the authority of members in the COP of the Irrigation Organisation and the wider networks of power and hegemonic masculinity in which they operate. As noted, the interpretative community of the COP of the Irrigation Organisation consists largely of male specialists (see also below) and 'their' use of irrigation data in policy should therefore be scrutinized in this study.

An obvious disadvantage in this approach is that many of the technical intricacies in the construction of irrigation data get 'lost' in the analysis, particularly when using policy documents from different time bound contexts. On the other hand, a selection of old and new documents allows to capture the 'large-scale' experience of members in the COP of the Irrigation Organisation. In Nepal, it can be said that irrigation policy and water planning is still influenced by the first-generation irrigation engineers and policy makers (Regmi, 2004: 96), although this is certainly shifting now. A key planning document for the first generation of irrigation engineers was the Master Plan of 1970 (HMG-N, 1970b), and the experience reflected in this document can still be seen to structure a (liminal) desire of professionals and the presentation of irrigation data in policy today. The other documents have been selected because they represent the most recent databases in Nepal on irrigation.

In the analysis, I pull out graphs of documents and I make extensive use of tables and figures that I have constructed myself. The use of visual representations add a performative element to the analysis, bringing out more clearly the 'show' of irrigation data in policy. The geometrical simplicity of tables and figures add aesthetic value to the data and it makes the analysis appear clear and rigorous, also for the performances that I have created myself.

6.2.1 The experience of first-generation irrigation engineers and policy makers

The first-generation irrigation engineers in Nepal started their career in the mid-1950s. They spent a substantial part of their energy on building-up the organisational and planning capacity of a state agency that would later become the DOI (see Chapter 2 and 3). They also were involved in the implementation of canal irrigation systems in the Terai, but the real challenge laid in strengthening the administration and carving out a professional position for engineers in the structure of the then government of Nepal. Two of these men and engineers were Nanda Kishore Agrawal and Bubanesh Kumar Pradhan, respectively known in Nepal as the 'Irrigation Man' and the 'Water Emperor' (*jal samrat*). I bring these men to the stage because they are honoured to date in the irrigation engineering community in Nepal and known in the administration as exemplary or typical leaders of state irrigation development. N.K. Agrawal, among other posts, chief engineer of the Minor Irrigation Programme in the 1960s, was immortalized in an e-mail circulation of INPIM/N as the Irrigation Man. He was also named as the Nepalese 'Bharat Singh' of Roorkee, a 'karmayogi' and 'a statesman of our surface irrigation systems in Nepal' (INPIM/N e-mail circulation, 1, 9 and 11 February 2012).[37] B.K. Pradhan, retired but still active in the field of irrigation and water resources management (see B.K. Pradhan, 2009), was dubbed the Water Emperor by Jhal Nath Khanal, a politician who later became the prime minister in Nepal in 2011 for a period of 6 months. Gyawali (2009) refers to him as the 'then "baron" of the irrigation sector' (p.296). Both men got their bachelor's degree in civil engineering at Roorkee College in India in the 1950s. B.K. Pradhan became the Director General of the department in the early 1970s and both men become secretaries in the WECS in the early 1980s (see Annex 41 and 42 for their CVs).

The first Master Plan of Irrigation Development in Nepal formed a landmark for these men and for the then MOWR and the then DIDW. It laid out a 20-year vision for state irrigation development in the Terai on a large scale according to international scientific and professional standards. The predecessor of MOWR, the MOWP had recently been established in 1965, and the Ministry and DIDW employed at that time about 100 to 150 engineers (no exact numbers are available) (see Chapter 3). The plan was a product of cooperation in the COP of the Irrigation Organisation and international experts had a substantial role in its construction. I have not been able to trace the authors of the document, but it certainly had input from experts of the United Nations Development Fund (UNDP), USAID, WB and ADB. In 1962, the government of Nepal signed an agreement with the USAID for the 'Hydrological Investigation Project' (Rising Nepal, 29 March 1967; Nepal, 1967; Sharma, 2004), aiming to place flow gauging stations in all major rivers in Nepal, and from 1966 to 1972, the UN sponsored a feasibility study in the Terai plains for irrigation development (DIHM/Nippon Koei, 1972).[38] In addition, the agricultural planning advisor of the FAO, stationed in Nepal between 1966 and 1969, was asked to advise on irrigation (Donner, 1967; FAO, 1969). As noted, also the WB and ADB started operations in Nepal in the mid-1960s, replacing the role of India as the prime financer of irrigation development (see Chapter 2; see also Rising Nepal, 16 June 1966 and 25 June 1966). Once the plan was adopted, ADB acted as the financer of the first priority project of 24.000 ha: the 'Chituan valley project' (HMG-N, 1970b; ADB/Agrar, 1972; HMG-N/ADB, 1972) (see Chapter 7 for an elaborate history).

[37] Bharat Singh (Roorkee graduate 1945) was a famous Indian expert on dams and irrigation. The qualifications of a karmayogi are being free from lust, greed, anger and egoism.

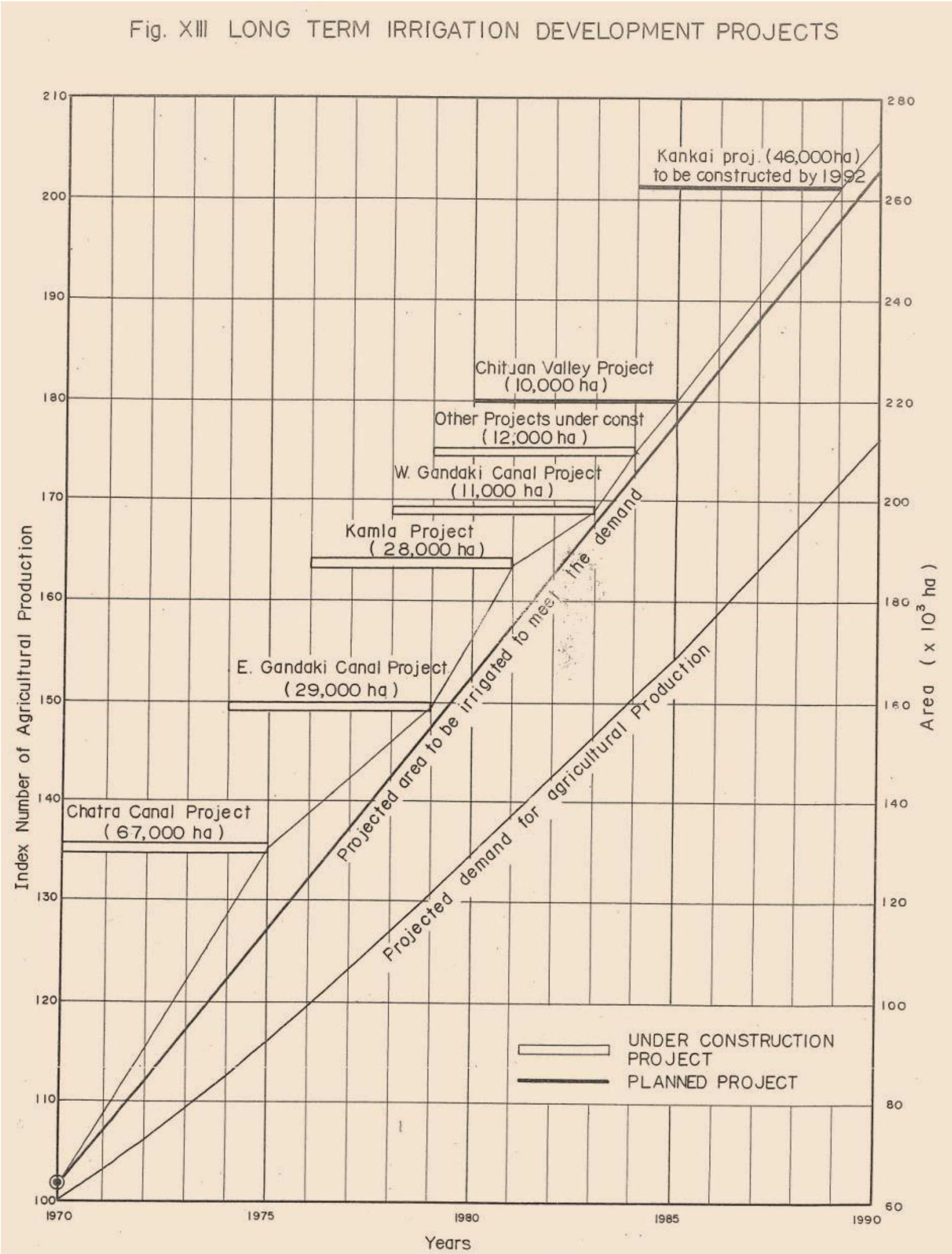
[38] One of the experts of USAID was Woodrow W. Evett, a surface water hydrologist, working in close relation with the Nepalese counterpart G.L. Amatya of the Survey Department (Rising Nepal, 21 June 1966).

The Master Plan reflected and structured the experience of members in the COP of the Irrigation Organisation, at that time *and* for the time to come, as I will show. This can be illustrated with a graph from the master plan (see Figure 6.1). This graph shows a projection of the 'long term irrigation development projects' perceived necessary to meet the required level of agricultural production for the period 1970-1990. The graph follows international scientific norms like the 'agricultural production index', taking 1970 as the base year and calculating a projection for agricultural production in terms of an index number by dividing the aggregate of different agricultural commodities for a given year by the average aggregate for the base year.[39] Another international technical norm that shapes the graph is the measurement of irrigation development in terms of area, depicted in the unit of hectares (ha). In its basic elements, the chart consists of two linear lines, one showing the 'projected demand for agricultural production' and the other line showing the 'projected area to be irrigated to meet the demand'. It indicates that the area to be irrigated is related to projects that were planned or under construction. The graph can be seen as an expression or story line of a shared experience of Nepalese irrigation engineers, state planners and foreign development experts, as it existed in the early 1970s, showing a desire for state irrigation development in a way that appealed to the imagination of members in the COP of the Irrigation Organisation. In its performativity, the graph enacts a vision of state irrigation development and it can be considered a 'show' of professional expertise, granting credibility to the views and voices of its authors and its promoters – the Irrigation Man and the Water Emperor.

More specifically, the figure shows, in a very condensed form, that increasing agricultural production was supposed to be about an expansion of the irrigated area, which in turn was importantly supposed to be about the management and implementation of new surface irrigation projects. When assessing the performativity of the chart and seeing it as a ritual display in irrigation planning documents, such a graph tries to convince members in the COP of the Irrigation Organisation of the way the world is and what it can be. In short, it reveals that 'their' desire is moulded in an experience that is marked by beginnings (underdevelopment, insufficient irrigated area), middles (development, the construction of irrigation infrastructure) and endings (modernization, plenty of irrigated area in Nepal).

[39] See for a full method of calculation of the agricultural production index: the Monthly Bulletin of Statistics Online of UN-data, www.unstats.un.org (visited 22 July 2014).

Figure 6.1: 'Fig. XIII Long term irrigation development projects'



Source: HMG-N, 1970b (Figure XIII).

This example illustrates that (projected) data in irrigation policy are capable both to reflect (or describe) and to structure (or enact) desire, customs and particular beliefs of members of the COP of the Irrigation Organisation. The numbers and categories in which the numbers are put in Figure 6.1 – the basics of the graph – obtain meaning through 'their' experience. For instance, the line for the area to be irrigated can only be drawn on the condition that the numbers 63.000 ha, 165.000 ha and 265.000 ha have been labelled as 'area to be irrigated' for 1970, 1980 and 1990 respectively, and the number 63.000 ha for 1970 can only be constructed as the existing irrigated area, as a 'fact', in an experience that has an hypothetical past (there was insufficient irrigated area) and an anticipated future (more area irrigated area will be developed). Irrigation data in policy can be seen to show simultaneously what state irrigation development is believed to be about *and* what it should be about.

To iterate, the graph also obtains meaning through technical performance, for instance, through the use of scientific standards like the agricultural production index. As noted, the technical dimension of performance is ignored here for the sake of the analysis.

6.2.2 The construction of data on irrigation development

The master plan was not the only policy document that reflected and structured desire of members in the COP of the Irrigation Organisation, it can be seen to have occurred in all the policies of the last six decades that present irrigation data. Up to the 1980s, members in the COP of the Irrigation Organisation shared particular beliefs on the construction of large public canal irrigation schemes in the Terai, and the numbers collected by the predecessors of the DOI on 'total irrigated area' basically reflected the 'planned' irrigated area rather than the 'actual' irrigated area (Sharma and Shukla, 1997; Shukla *et al*., 2002; P. Pradhan, 2007). In addition, the DOI had the custom to only count the surface irrigation systems that had fixed head works, in line with the preconceived idea that irrigation development is about the harnessing of surface waters through the construction of dams and canals.[40]

Around 1980, the show of irrigation data in policy changed radically when it was estimated that approximately 400.000 ha was irrigated by temporary yet existing stone and brushwood diversion structures which were managed by farmers (WECS, 1981; P. Pradhan, 1989; Belbase, 2010). This estimate was based on the land tax assessment records of the Ministry of Finance, an agency that had always registered land in four categories of productivity based on the availability of irrigation. Evidently, irrigation professionals, both foreign experts and irrigation engineers in Nepal, had always know about the existence of community irrigation (FAO, 1953; Dahal, 1997; Sharma, 2004), but it was not given any thought because the systems did not reflect the particular beliefs of engineers and planners of modern (state)

[40] Personal communication with Madhav Belbase in 2010, regional director of the DOI. Initially, the government did not count community irrigation systems because they did not have fixed head works.

surface irrigation. In the early 1980s, the thinking on traditional systems was no longer a liminal matter for members in the COP of the Irrigation Organisation who now dealt with cash-strapped administrators and funding organizations with a fiscal reform agenda, notably the WB and ADB. In addition, in the late 1980s, the DOI came to assume responsibilities for community irrigation projects, as most intervention programmes of the DA and MPLD came to fall under the mandate of the DOI (see Chapter 3). Since then, data collection by the DOI has included a category on 'non-government' or so-called 'farmer managed irrigation systems' (DOI/WB/UNDP, 1989).

In a similar fashion, the interpretative community of the COP of the Irrigation Organisation habitually overlooked the development of groundwater irrigation. Since the 1970s, the then DIHM was involved in some installation of deep groundwater tubewells and the ADB-N had financed some implementation of shallow tubewells in the Terai (see Gautam, 2006 for an overview), but this type of irrigation expansion did not reflect the particular beliefs on surface water development that were shared among members in the COP of the Irrigation Organisation. This changed when the second 'Master Plan for Irrigation Development in Nepal' for the 1990s identified groundwater development in the Terai as a promising means to achieve rapid gains in food production prior to the implementation of large-scale surface irrigation schemes (DOI/WB/UNDP, 1989: see p.xiv), and when the responsibility for shallow tube well irrigation came to fall under DOI in the early 1990s (Gautam, 2006). Since then, groundwater irrigation is part of the show of irrigation data. The latest entry into the show of irrigation data in policy is the category of 'non-conventional irrigation', a set of small-scale irrigation technologies (e.g. drip, sprinkler, multiple use systems) that has been actively promoted in Nepal in the last decade by international aid organizations (Upadhyay, 2004).

All these changes in the professional experience relate to dramatic changes in the show of irrigation data. Table 6.1 shows an evolution of irrigation data in Nepal – a performance that I have constructed myself by using mainly datasets of the DOI. The exact meaning of the numbers and the categories in Table 6.1 is explained below. The numbers in Table 6.1 (or rather the lack of numbers in particular periods) illustrate that irrigation data in various policies have always created a reality but only in the context of its own numbers (Law, 2009). In other words, 'only what is counted counts' (Turnhout and Boonman-Berson, 2011 cited in Behagel, 2012: 112). As noted, this is not the same as saying that irrigation data in Nepal are characterized by a lack of methodological rigour or are an example of 'bad' data collection. On the contrary, the numbers did precisely what they were supposed to do, namely reflecting the particular beliefs of members in the COP of the Irrigation Organisation on what constitutes state irrigation development. In this capacity, the meaning of the numbers lies in the recognition of customs and habituated practices in the profession, structuring experience and policy discussions in particular periods of time in a less than fully conscious way. And this is exactly what the show of irrigation data in policy in Nepal continues to *do*, creating an apparently uniform reality, a process identified by Behagel (2012) as 'convergence'.

Table 6.1: The evolution of data on state irrigation development in Nepal

Year	Total irrigated area (ha)	Government systems (ha)	Farmer managed irrigation systems (ha)		Ground water (ha)	Non-conventional (ha)
		Terai	Terai	Hills & Mountains	Terai	Terai, Hills & Mountains
1961	31.900	31.900				
1970	117.500	117.500				
1972	180.000	180.000				
1980	267.000	267.000				
1981	875.000	"	458.000	150.000		
1988	1.019.000	350.000	"	"	61.000	
1990	1.216.605	547.605	"	"	"	
2006	1.252.406	314.521	416.184	229.532	278.158	13.011

Sources: Compilation of numbers as presented in Biswas, 1989; WECS, 1981; DOI/WB/UNDP, 1989 and DOI/CERD, 2007.

At the same time, the show of irrigation data in Nepal has never been as straightforward as suggested in Table 6.1. As described in Chapter 2 and 3, there always have been various international and national (state) agencies involved in irrigation development in Nepal, generating their own datasets. Today, the DOI, DA, ADB-N and CBS produce their own datasets – the DBID database and agricultural census of CBS are examples – and the WB and ADB periodically review agricultural development strategies as part of their aid programmes, and these documents often contain a state of the art of irrigation development in Nepal – the above mentioned ADB report on irrigation is an example (ADB, 2012a). The current use of irrigation data in policy in Nepal is characterized by a situation of abundance. The extensive overlap of data and the wealth of apparent contradictions in the numbers enact a diversity of realities, a situation identified by Behagel (2012) as 'divergence'. Keeping track of the numbers has been an administrative requirement of all times, but with a critical debate in Nepal on irrigation system performance that has taken place (Shivakoti, 1994; Shivakoti and Ostrom, 2002); an expanding role of foreign aid and donor organisations in irrigation development and an international trend of concept standardization, data-basing and uniform performance measurement in irrigation policy (compare Behagel, 2012 for nature and conservation policy), it can be seen that 'abundance' has become a distinct characteristic of today's irrigation data production and policy formulation.

Upon closer inspection, it appears that abundance is created through a widespread circulation and reworking of existing irrigation datasets among and between the above mentioned institutions and other agencies in the COP of the Irrigation Organisation, as new projects and policies are taken up. Particularly the datasets produced by the main irrigation (state) authority in Nepal, the DOI, are popular for reproduction. To iterate, the reworking of numbers on irrigation is a very social (and ritualized) process. Members in the COP of the Irrigation Organisation may pursue a multiplicity of interests but they share a (liminal) desire, customs and particular beliefs and they participate in the established order and presentation of knowledge. Creating a new dataset on irrigation is importantly about reworking and expressing a 'new' experience, simultaneously a condition for, and an outcome of the making of professional coherence. As noted, irrigation professionals share a liminal awareness about this process. To illustrate, most organizations and professionals involved in irrigation qualify the reworking of irrigation data as a weak point and complain regularly about the lack of 'consistent' and 'reliable' data collection, and they often end up blaming the DOI for having insufficient capacity to collect and analyse statistics on irrigation (see for a history of this argument: FAO, 1953; Donner, 1967; WECS, 1981; DOI/WB/UNDP, 1989; ADB, 2012a). In the performance perspective, however, 'inconsistencies' in data presentation – overlapping definitions, new columns, revised categories – are an expression of a process of 'culture in the making'. They represent attempts of professionals to give expression to their experience.

To explore this process of 'culture in the making', the remaining of this chapter focusses on the three (recent) irrigation datasets and policy documents named above (CBS, 2006; DOI/CERD, 2007; ADB, 2012a). At the time of writing this chapter (in 2012), these documents presented the most recent and updated irrigation data available.

The DBID database and the ADB study are the most familiar and legible datasets for members in the COP of the Irrigation Organisation. The first DBID database was made in 1997, based on the fiscal year of 1995/96, and was updated and reviewed in 2007 with data from the fiscal year of 2005/06. It is based on district-wise and project-wise data collection. The DBID database includes various types of irrigation systems in Nepal: public schemes developed by the DOI, FMIS systems, groundwater projects and schemes that are considered 'non-conventional irrigation' (e.g. drip, sprinkler, multiple use systems) (DOI/CERD, 2007). It also brings together in tabular form information of various government departments and non-governmental organizations, notably of the DOI, DA, ADB-N and INGOs, as well as data of various projects executed by the government of Nepal under WB and ADB funding.

The study of the ADB was published in May 2012 and reproduces irrigation statistics provided by the DOI and other government agencies, notably the ADB-N. Most numbers on surface irrigation systems appear to originate from 2005, 2006 or 2007 (see p.148-152), and information on groundwater irrigation dates from 2011 (see p.109). The report is a review of the Agricultural Perspective Plan (APP) of 1995, the lead policy plan for agricultural development in Nepal, assessing the status after 15 years of implementation and supported by institutions like the WB, FAO, DFID, USAID and the European Union (EU). The report was written by consultants and it can be seen as an example how irrigation data of the DOI and other agencies are used and reworked as part of a process of policy formulation.

The CBS data on irrigation are based on the agricultural census of 2001/02 and are presented in the 'Agricultural Monograph' (CBS, 2006: see p.120-128). The CBS has been conducting an agricultural census every ten years, since 1961.[41] The CBS 'counts' irrigated land holdings in the country through sampling. The samples can be as low as 2% of the total number of holdings in some districts, like in Jhapa and Morang in the Eastern Terai. The data have then been processed to obtain a statistically derived estimate for the whole country. The CBS is primarily concerned with uniformity in data presentation, and this is reflected in the 'independent' choice of categories, namely 'tubewell/bore', 'canal (permanent)', 'canal (seasonal)', 'pond/well', 'others' and 'mixed'.[42] The data of the CBS on irrigation appear not to be used by members in the COP of the Irrigation Organisation. I treat the data of the CBS as a 'contrasting' performance of irrigation knowledge, enacting a reality that is different from the reality enacted by the numbers in the DBID database and the ADB report.

The irrigation data of the DOI and the ADB can be considered the mainstream irrigation data in Nepal, and therefore I focus particularly on the show of these data. I use the CBS data to illustrate that the mainstream irrigation data create a reality *only* within the limits of its own numbers. To clarify, this analysis requires a great deal of talk on numbers, but the goal is *not* to get the numbers 'right', nor to discuss in detail all the supposed 'inconsistencies' in the data. Translated in the view of Mosse (2005), data are not 'wrong' or 'inconsistent'; they can only be considered wrong or inconsistent by wider networks of support and validation.

6.2.3 The "reality" of mainstream irrigation data

The labels of the categories presented below, in the tables and charts, have been taken from the DBID unless mentioned otherwise, and are shown between single hyphens. By and large, these labels also are used in the ADB study. Most of these categories were conceived in the second master plan in Nepal on irrigation (DOI/WB/UNDP, 1989). This plan was prepared by the Canadian International Water and Energy Consultants in association with a Nepalese

[41] The agricultural census of 2011 was not published yet at the time of writing this chapter.

[42] No definitions are given for these terms in the Agricultural Monograph (CBS, 2006).

consultancy firm East Consult, and funded by the WB under the UNDP programme. The plan listed ‘DOI projects’, ‘agency assisted farmer managed irrigation systems’ (AAFMIS), and ‘groundwater projects’ (DOI/WB/UNDP, 1989: 31 and 40). The exact meaning of these categories, and the meaning of the numbers attached to those labels, is described in this section. As noted, I use self-constructed tables and charts to bring out the ‘show’ of the irrigation data more clearly, based on the numbers of the DBID database.

Table 6.2: Irrigation development according to the irrigation data

Irrigation scheme type	**Area (ha)**		
	DOI/CERD, 2007 (2005/06)	**ADB, 2012a (2005-2011)**	**CBS, 2006 (2001/02)**
‘DOI project’	314.521	314.521	**
‘Non-assisted FMIS’	312.289	284.348	
‘Agency assisted FMIS project, rehabilitation’	295.258	298.665	
‘Agency assisted FMIS project, new’	38.169	38.650	
Total ‘surface irrigation’	**960.237**	**936.184**	**868.100**
‘DOI project’/ ‘Shallow tube well’	53.964	139.992	***
‘DOI project’/ ‘Deep/Medium tube well’	34.455	39.075	
‘ADP Janakpur’/ ‘Shallow tube well’	18.151	10.345	
‘ADP Janakpur’/ ‘Deep/Medium tube well’	3.645	6.060	
‘ADB-N’/ ’Shallow tube well’	167.943	167.943	
Total ‘groundwater irrigation’	**278.158**	**363.415**	**238.800**
‘Mixed’	*	*	14.600
‘Non-conventional projects’	13.011	13.011	*
‘Other’	*	*	46.900
Total other	**13.011**	**13.011**	**61.500**
Total	**1.251.406**	**1.312.610**	**1.168.400**

Notes: * Not noted, ** Mentioned as ‘canal’ irrigation with a distinction in ‘seasonal’ and ‘permanent’, *** Mentioned as ‘tubewell/bore’ and ‘pond/well’ irrigation.

Table 6.2 presents the ‘show’ of the irrigation data according to the DBID (DOI/CERD, 2007), the ADB (2012a) and the CBS (2006) – displayed in three separate columns. As explained, the names of the categories in Table 6.2 have been taken over from the DBID, except for the categories ‘mixed’ and ‘other’, which have been taken from CBS. It shows that the total irrigated area in Nepal was thought to be as low as 1.168.400 ha in 2001 (CBS) and as high as 1.312.610 ha in 2011 (ADB). Within the reality of these numbers, this calculates to about 8% of the total land area in Nepal, and about 46% of the cultivated land area.[43] Generally, these numbers are presented under the category 'culturable command area' (CCA) or simply under 'irrigated area' without any further definition (see Annex 43 for specification).

Under the label 'DOI project'/ 'surface irrigation', medium and large-scale irrigation systems in the Terai are counted, up to 66.000 ha (Kosi Agreement: Sunsari-Morang Irrigation Project). These systems have been built by India or Nepal (see Chapter 2), and they are administered by the DOI in combination with WUAs since the 1990s (Khanal, 2003). It is perceived that they cover approximately 25% of the irrigated area in Nepal according to the DBID. The next three categories under 'surface irrigation' list so-called 'FMIS' schemes, which are thought to cover in total about 52% of the irrigated area. As explained in Chapter 2, the term 'FMIS' was coined in the 1980s to describe traditional systems that are largely managed and maintained by users. They can be located in the Terai, the Hills or the Mountains (see Figure 6.3 below). It is anticipated that about 53% of these systems have received assistance from a government agency for rehabilitation or construction. Government agencies involved here, with or without foreign assistance, have been the DOI, DA, ADB-N or MPLD, now known as the Ministry of Federal Affairs and Local Development.

The following five categories in Table 6.2 under 'groundwater irrigation' are shallow and tubewell projects in the Terai, executed by the DOI, DA (Agricultural Development Project in Janakpur or 'ADP Janakpur') and ADB-N respectively. Within the logic of the numbers, these projects cover a total irrigated area of approximately 24%. Most wells have been co-financed by farmers and are managed and maintained by user groups after installation by the government (Ansari and P. Pradhan, 1991). The last categories mentioned in Table 6.2 are 'mixed', 'non-conventional projects' and 'other'. In the category 'non-conventional projects', small irrigation technology is counted, such as drip, sprinkler, water harvesting tanks, pedal pumps, cemented tanks, and small motor pump schemes. The categories 'mixed' and 'other' have been taken from CBS and are not defined and specified in the Agricultural Monograph.[44]

Figure 6.2 presents the irrigated area for the 'monsoon' and 'year round' irrigation according to the DBID. It shows that it is anticipated that out of a total 'irrigated' or 'culturable command area' of 1.251.406 ha, about 745.555 ha has access to year-round irrigation (60%). For the surface systems, this is about 467.287 ha or 37% of the total irrigated area, mostly the agency assisted FMIS projects, and this appears to compare reasonably well with the 346.800

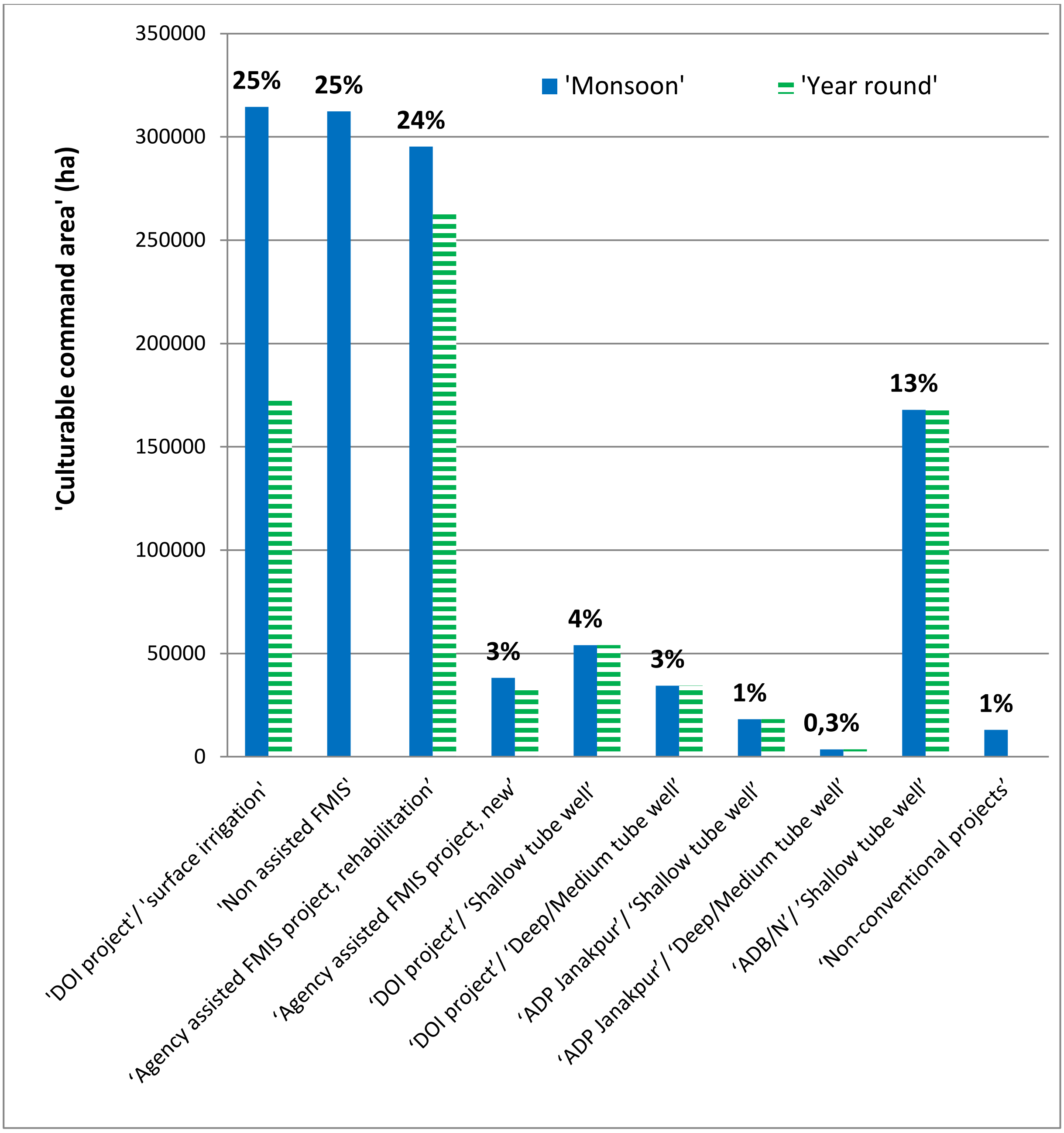
[43] For comparison, the CBS (2006) mentions that 60% of the cultivated land area is irrigated in Nepal (p.120).

[44] I assume that the label 'mixed' is meant to cover those areas that are served by surface and groundwater.

ha given by the CBS under the category of 'permanent' canal irrigation (not shown as a separate category in Table 6.2). The meaning of year-round irrigation is discussed below.

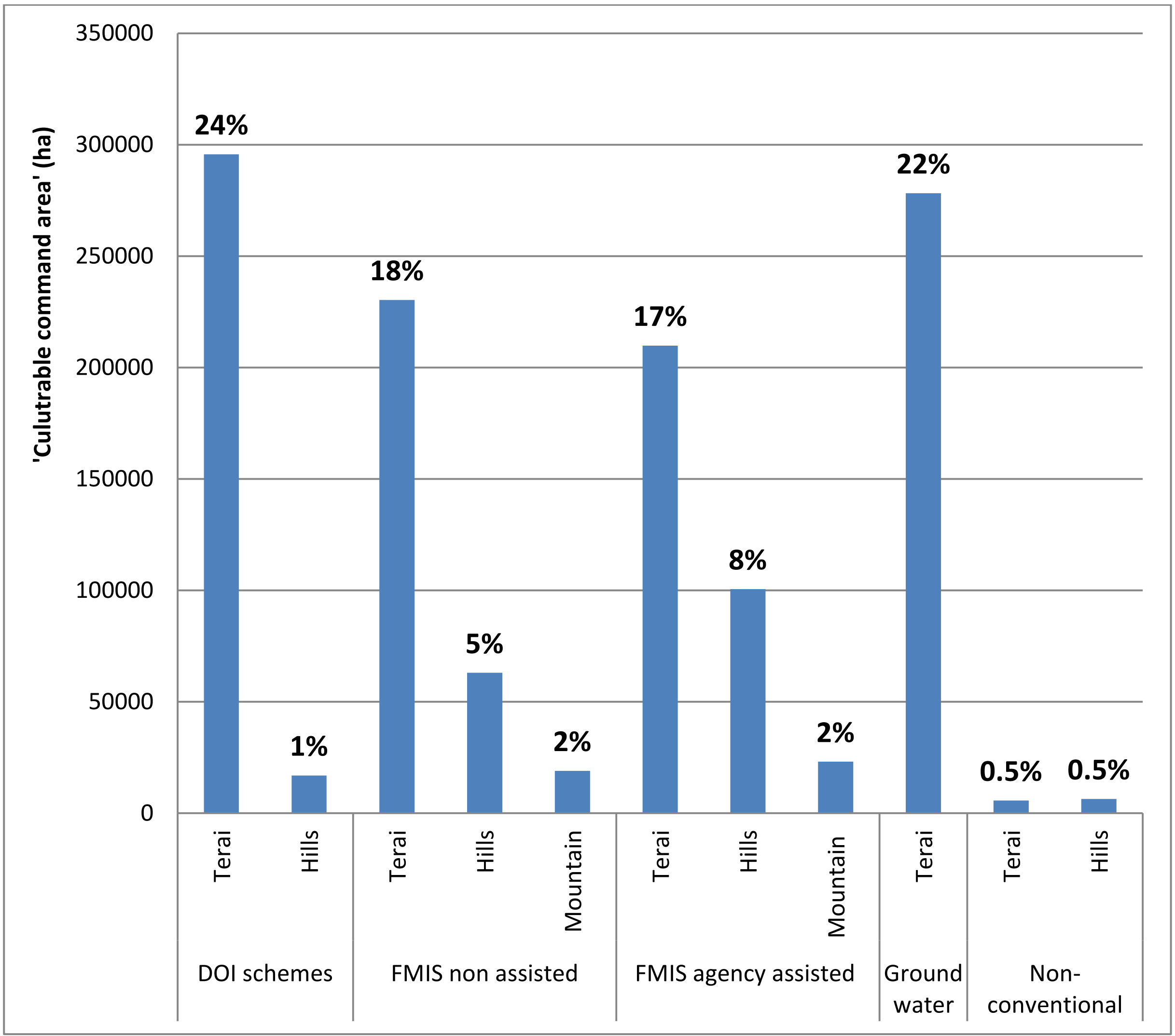
In Nepal, policy makers make a distinction between the main ecological zones of the country (Terai, Hills and Mountains). This is also done in the irrigation sector, see Figure 6.3 for a presentation of the irrigation statistics of the DBID. As shown in Figure 6.3, it is expected that about 81%, 15% and 4% of the irrigated area is thought to be situated in the Terai, Hills and Mountains respectively.

Figure 6.2: Irrigated area in Nepal



Source: DOI/CERD, 2007. See Annex 44.

Figure 6.3: Irrigated area per scheme type in ecological zones of Nepal



Source: DOI/CERD, 2007. See Annex 45. **Note:** The labels are not original. The schemes that account for less than 0.5% in an ecological zone are not shown in this figure.

Table 6.3: Infrastructure development in agency implemented or assisted projects

Scheme type	**Extensive development (ED)** Service area: 300 to 500 ha	**Intensive development (ID)** Service area: 30 to 50 ha	**Command Area Development (CAD)** Service area: 3 to 5 ha
'DOI' schemes	110.440	47.958	156.123
'FMIS' agency assisted (total)	78.173	255.253	1
'Groundwater' (total)	0	278.158	0
Total	**188.613**	**581.368**	**156.124**

Source: DOI/CERD, 2007.

For the categories of 'DOI schemes', 'non-assisted FMIS' and 'groundwater irrigation', the DBID database has spelled out the degree of infrastructure development in the command area of the systems (see Table 6.3). These categories are only applied for irrigation in the Terai (ADB/APROSC, 1990: 25). The DBID makes a distinction between three categories of infrastructure development, namely 'extensive', 'intensive' and 'command area' development. Extensive development means that an intake, main canal and sometimes secondary canals have been constructed, servicing blocks of 300 to 500 ha. Intensive means that the canal network has been developed up to the tertiary unit, servicing block of 30 to 50 ha. Command Area Development (CAD) means that a canal system has also been developed (through input of the state) within the tertiary unit, basically up to the field level, servicing plots of land of 3 to 5 ha. It reveals that all groundwater irrigation projects are classified under intensive development and are thought to service blocks between 30 and 50 ha.

6.3 What irrigation data in policy do

If we see the presentation of irrigation data in policy as a 'show', then straightforward questions follow: What show do they perform and what realities are they helping to generate? And for whom? To answer these questions I attempt to deconstruct the data on irrigation and explore the most important preconceived ideas of members in the COP of the Irrigation Organisation that underpin the numbers as shown above. Without being familiar with the liminal desire, customs, and particular beliefs of irrigation specialists, the irrigation statistics are practically illegible. I analyse the numbers on irrigation in four layers by taking apparent 'inconsistencies' and 'gaps' in the data as an entry point, and by comparing the reality of the irrigation statistics with those experienced by farmers as described in literature. To recall, it is important to understand what it is that is shown (and what it is that is not) because it reflects and structures experience and desire of members in the COP of the Irrigation Organisation. In my analysis, I refer to a handful of irrigation systems in Nepal as examples.

6.3.1 Layer one: The irrigated area

Right at the surface, there is the preconceived idea of an 'irrigated area' measured in hectares. When asked, farmers in Nepal consider the 'irrigated area' to be a plot of land that is irrigated in the monsoon for rice cultivation, known as *khet*. Sometimes this land also is irrigated in the winter and spring (P. Pradhan, 1989). In the data on irrigation, the term 'irrigated area' is differently defined. It refers to the 'command area' of a system, differentiated in a gross and net area, the overall geographical area and the actual fields that are serviced respectively. In these definitions, a type of crop is not specified, nor a particular season mentioned. Perhaps then, the display of numbers on an irrigated area is the first 'reality' that is enacted.

The DBID presents numbers under the label 'irrigated area' or 'culturable command area', and the CBS categorizes them under 'irrigated area' (see Table 6.2). These terms are commonly used among professionals and no definition is given in the documents (CBS, 2006;

DOI/CERD, 2007). The ADB uses the term 'irrigable area', which the bank defines as 'the area that can be irrigated in *a given season*; often *the maximum area* within an irrigation system that can be irrigated in a "normal" year' (emphasis added) (ADB, 2012a: iii). The definition of the ADB suggests then that the numbers in Table 6.2 are reflecting an ideal situation of the developed or potential irrigated area in the monsoon. This should not come as a surprise, it is common international practice in the construction of irrigation data (see for example AQUASTAT of the FAO). It enacts a reality of state irrigation development as a maximum stipulated area under irrigation in specific projects.

In descriptions of the experience of farmers (see for instance Shukla and Sharma, 1997), it is mentioned that irrigation in the 'maximum stipulated area' is not always available in all seasons. In the DBID, the total sum of the 'culturable command area' in 'DOI projects' for surface irrigation is constructed by adding up the areas for each project that are listed under 'net developed command area' (see column 6 in Table 6.4 as an example). This produces a total number of 324.171 ha for 'DOI projects' in Nepal (see DOI/CERD, 2007, p.17).[45] As can be seen in Table 6.4 (see column 7), the DBID also presents numbers for each DOI project under 'irrigated command area', differentiating between the 'summer' (read: monsoon) and 'winter' season. Sometimes, the numbers under the two categories (developed command area/net and irrigated command area/summer) are the same (see Pithuwa IP in Table 6.4) and sometimes, they are not (see Chitwan IP in Table 6.4). When the numbers under the latter category are taken as a reference (irrigated command area/summer), as the total irrigated area in DOI projects in Nepal for one season (the monsoon), it shows a number of 224.995 ha (see DOI/CERD, 2007, p.17). The difference between the numbers illustrate that the irrigated area in the monsoon and in other seasons, in many systems in Nepal, can be markedly lower, up to 31% less for surface irrigation in DOI projects in the monsoon. The numbers of the DBID database can thus be seen to enact a particular reality in Nepal on an irrigated area.

Table 6.4: An example of the categorization of irrigated area in two DOI projects

Irrigation Project (IP)	District	Planned command area		Developed command area		Irrigated command area	
		Gross	Net	Gross	Net	Summer	Winter
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pithuwa IP	Chitwan	600	500	600	500	500	100
Chitwan IP	Chitwan	13.400	10.400	13.400	10.400	8.300	2.000

Source: DBID (DOI/CERD, 2007; p.11).

[45] The number mentioned in Table 6.2 (main text) for DOI projects is lower, namely 314.521 ha. This number is also derived from the DBID database (see DOI/CERD, 2007, p.4, under 'highlights of irrigation development').

6.3.2 Layer two: Year round irrigation and system technology

A second preconceived idea that lies at the surface of the show is 'year round irrigation', a term that is too vague to be of any use for farmers in their irrigation practices. To illustrate the point, in the monsoon, farmers rely on rainfall for rice cultivation and irrigation is used as a supplement to help land preparation and planting, and prevent crop failure. In the winter, main crops like wheat and mustard in Chitwan and Palpa district, in the Terai and the Hills respectively, rely on soil moisture or rains, except for rice which needs irrigation (Yoder, 1986; DOI/Nippon Koei/Silt, 1990). Crop cultivation in the spring is only possible with a guaranteed supply of irrigation. For farmers, the meaning of 'irrigated area' changes throughout the year, depending among others on the availability of rain and the type of crop cultivated. In irrigation policy, the term year-round irrigation was articulated in the late 1960s and adopted in the above-mentioned first master plan in Nepal on irrigation development. It basically means two or more crops from the land per year (HMG-N, 1970b). Also in this definition, a type of crop is not specified, nor particular seasons mentioned. This listing of numbers under 'year round irrigation' can thus be seen as a second reality that is enacted.

The use of the term year-round irrigation can be seen to express particular beliefs on system technology in irrigation. The term is essentially used by irrigation professionals as a substitute for cropping intensity, a concept of limited use for irrigation engineers and other irrigation (technology) specialists because it does not relate crop production to irrigation technology. Illustratively, the ADB study (2012a) refers to the 'Agricultural Perspective Plan' of 1995 which specifies year-round irrigation as a potential cropping intensity of at least 200% for *surface schemes*. In a similar fashion, CBS (2006) refers to 'permanent' irrigation for *canal systems*. These definitions reveal that the term 'year round irrigation' is primarily related to particular system technology – and secondary to irrigation. The concept year-round irrigation can be seen to enact a particular reality that makes the use (and potential benefit) of surface water systems in irrigation (e.g. diversion works, reservoirs, canals) appear self-evident.

There are more examples to give, particularly in relation to the presentation of about 300.000 ha of 'non-assisted FMIS' and groundwater projects, and how these categories obtain meaning in the data in relation to the term year-round irrigation. For reasons of space, these examples are not discussed here (see Zwarteveen and Liebrand, forthcoming for elaboration).

6.3.3 Layer three: Sources for irrigation

Layer number three. The show of the irrigation data is based on the preconceived idea that an irrigation system is supplied by one source of water, surface or groundwater, and that an area is serviced by one source/system. The assumption here is that a farmer uses one source/system for irrigation to meet crop water requirements in the field. In contrast, farmers often talk about multiple, changing and conjunctive uses of water sources for irrigation – terms that are not specified in the definitions of the datasets.[46]

Irrigated areas often are served by more than one source of water, particularly in the Terai. In times of drought, farmers use groundwater through shallow and tube wells in areas that are also served by a surface irrigation system (Gautam, 2006). The command areas of FMIS systems in the Terai have sometimes two sources of surface water, because they have been incorporated, knowingly or otherwise, in outlays of new public irrigation systems (Levine, 1983) (see Textbox 6.2 for an example in Chitwan). In addition, FMIS systems in the Hills and the Terai often are part of a hydrological network of systems or 'landscapes of irrigation' (Coward, 2005), sharing one source of water (a small river or spring) and feeding into each other (the drain of one system is the source for the next system). From an hydrological point of view, it is then unclear whether an area consists of one or multiple systems and whether an area is supplied by one or two sources of water.

The habitual and strict use of categories for surface and groundwater in irrigation data structure the experience of foreign and national irrigation specialists in a critical way. Clearly, members in the COP of the Irrigation Organisation know about conjunctive water uses in irrigation in Nepal (Basnet, 1992; Gautam, 2006). Some DOI engineers readily explained to me about examples of conjunctive uses in the projects that they worked on, particularly in the Terai, and many international organizations involved in irrigation policy making, publish regularly about conjunctive water use (ICID/FAO, 1996; IWMI, 2004; WB, 2006). Yet, the categories of surface and groundwater and the particular belief that irrigation consists of clearly delineated and carefully constructed systems, controlled and managed by engineers or farmers, make the show of conjunctive water use in irrigation data a reality that appears inconsistent and as something that is not-existent. The CBS data illustrate, however, that irrigation data also can structure experience in a different way. The CBS data incorporate a category for 'mixed' and 'other' irrigation, accounting for a total area of 61.500 ha (see Table 6.2). The exact meaning of these categories is not specified, but it presumably covers areas that are irrigated by a mix of surface and groundwater through various means of technology (e.g. combination of canals, wells and natural flows).

Presumably, the number in the CBS data represents the tip of the iceberg for conjunctive water use in Nepal. So what is it that irrigation statistics do here? The complete absence of a category for conjunctive water use in the mainstream irrigation data, at least in the DBID database and the ADB report, effectively enacts a third reality of irrigation in Nepal.

[46] The ADB (2012a) proposes a category though for 'conjunctive use' of water for irrigated areas in the Terai.

6.3.4 Layer four: System control and irrigation policy

Layer number four follows this closely. Irrigation systems that neatly fit the descriptions of irrigation data in policy are actually hard to find in most locations of Nepal. As shown above, the categories in the irrigation data are preconceived, reflecting customs and particular beliefs, also reflecting (and structuring) ideas that shape (and enact) irrigation policy. A central concern for members in the COP of the Irrigation Organisation is the question of who controls or is supposed to control irrigation technology, and the experience of irrigation professionals is characterized here by strong beliefs in the use (and potential benefit) of particular irrigation infrastructure. These ideas have critically shaped the preconceived idea of 'DOI project', 'FMIS', 'groundwater projects', and 'non-conventional irrigation'. This show is so widely translated and the 'reality-enacting apparatuses' (Law, 2009: 248) are so strongly institutionalized in the COP of the Irrigation Organisation, that it has become difficult to image that other realities subsist alongside the reality shown in data on irrigation in policy.

First of all, the mainstream data on irrigation do not show the irrigated areas that fall outside these categories, notably the area served by privately installed shallow wells in the Terai (mostly shallow wells). According to a survey that I conducted in Chitwan District in 2010 in three villages, over 90% of the shallow wells in the area had been installed by farmers without any support of the government, and many of these dug wells were used for livestock and irrigation. This situation presumably also exists in other Terai districts, revealing that the area serviced by shallow wells, be it partially or completely, is substantial. This 'gap' in the show of irrigation data can be considered an example how data are capable to structure the experience of irrigation professionals. They may know about the existence of a large number of privately constructed shallow wells, but the particular beliefs on the use (and potential) of policy-driven and experts-controlled (state) irrigation development, which shape the categories of the data, makes the show of these wells in the data appear pointless. The effect is that the data enact a reality in which the use of dug wells is non-existent.

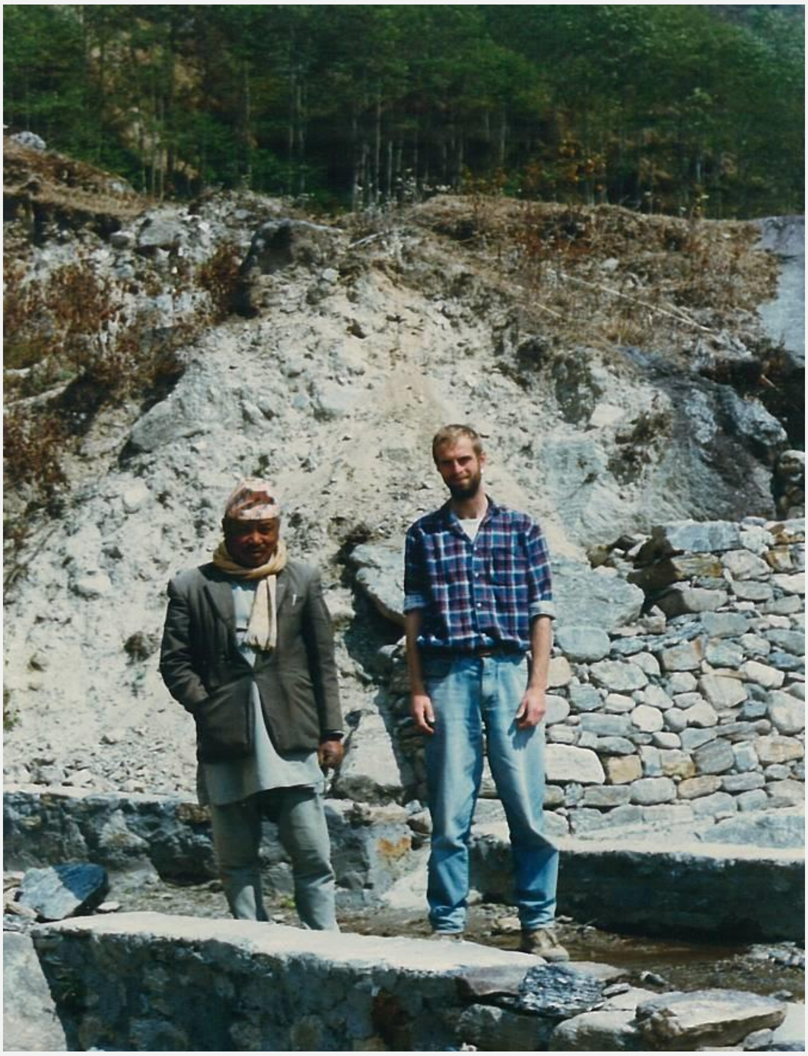
Second, as farmers talk about their systems, similar size irrigation systems in the Terai and in the Hills, operating under the same degree of users' participation in system management, under comparable (dependency) relations with the government, can technically be counted as 'DOI projects' or 'FMIS' schemes. Likewise, surface and groundwater systems managed by farmers can be counted as 'FMIS' or 'groundwater projects'. How an irrigation system is eventually counted is based on preconceived ideas how a scheme is believed (or supposed) to perform, and how it is believed (or supposed) to be managed according to irrigation policy. To illustrate, the national Irrigation Policy of 2003 in Nepal recognizes (and envisions) 6 system management types: (1) traditional systems (operated by users); (2) systems transferred by the government to non-government agencies and user associations (operated by users); (3) systems operated by the government; (4) systems operated in joint management by the [central] government and users associations; (5) systems operated in joint management by the local [government] bodies and the user association; and (6) systems operated in private level (see 'Chapter 2, Working Policy', section '2.6 System Management'). These categories are reflected in the irrigation data, structuring the discussion in policy. For instance, the term 'traditional systems' is described (and enacted) in the data through the term 'FMIS'. In the data, 'FMIS' is used to categorize existing or indigenous surface irrigation systems that are not supposed to rely on government resources, hence the term 'non assisted FMIS' in the DBID. In the case that schemes did receive government assistance for 'rehabilitation', it is expected that they continue or start operating autonomously, hence the term 'agency assisted FMIS' in the DBID. These categories may reflect the performance of some systems, but many 'traditional' irrigation schemes do not operate according to these criteria.

The mainstream statistics mention, for example, a category for 'new' FMIS, systems that have been constructed by the DOI after a so-called 'request' of the farmers. These schemes fall then perhaps in the category 'DOI project', was it not that they are believed and supposed to function as 'FMIS' according to irrigation policy (DOI, 1992; 2003). In case of assistance to FMIS, usually for 'rehabilitation', dependency relations between the farmers and the government gain impetus, and farmers continue approaching the government for another round of support (Liebrand and Yakami, 2010; Singh *et al*., 2014). In doing so, they are often successful, because they have become familiar with government procedures. 'FMIS' systems last then by relying on input of state resources (see Textbox 6.1 for an example).

Similarly, following a policy of PIM since the 1990s, many surface schemes of the DOI are today managed by WUAs, partially (at the branch and tertiary level) or completely (for systems of less than 2000 ha in the Terai) (Shukla and Sharma, 1997; Khanal, 2003). At times, these schemes function relatively autonomously, with high degrees of farmers' participation, just as is seen in indigenous systems in Nepal (Shivakoti and Ostrom, 2002). Technically, they also could qualify for the label 'FMIS', but they continue to be counted as 'DOI project' (see Textbox 6.2 for an example). This could be considered another instance of how irrigation data reflect and structure the experience of members in the COP of the Irrigation Organisation; they are accustomed to the idea that these systems were once constructed by the state, a reality that is enacted by the show of the irrigation data.

Textbox 6.1: Pauwa Sartap Irrigation Project in Panchtar District

This irrigation system is located in the Hills of East Nepal, in the Pauwa Sartap Village Development Committee (VDC). It is a typical hill system of approximately 100 ha, mainly serving water to the fields in the monsoon. About 400 households from different ethnic groups (Tamang, Limbu and 'lower caste' people) rely on the system for irrigation and household purposes. The length of the canal is 3,5 km and requires regular maintenance in terms of labour (yearly cleaning) and funds (repair and reconstruction). The system was built in 1988-1990 under the Mechi Project (see Chapter 1). The earthwork, stone cutting, stone masonry and building of gabions was done by the users under supervision of engineers of the government and SNV. Also a WUA and maintenance fund was established under the programme in 1990.



The village leader (*pradhan panch*) and
a Dutch engineer of SNV (1988-1990)

... to be continued on the next page

continued from the previous page...

The maintenance fund was spent within three years. In the period 1990-2010, the users handled repairs as much as possible, and they annually provided labour for canal cleaning. Nevertheless, the WUA had trouble to face bigger repair works and the system underwent gradual decline. Seepage losses became a serious concern after 2005. The farmers of the system, through the leader of the WUA and his connections, decided to request the government for additional assistance, and with success. In the 1990s, during two five-year planning periods, the WUA received small funds for maintenance from the VDC. In the fiscal year 2007/2008, and 2008/2009, the WUA obtained another Rs 30.000 and Rs 20.000 of the VDC administration respectively.

The Pauwa Sartapp Irrigation Project is counted in the DBID as a 'rehabilitation' project under the category of 'Surface Farmer Managed Irrigation Scheme' (agency assisted) (see Table 3 of the DBID, p.97).

Source: DOI/CERD, 2007; Liebrand and Yakami, 2010.

Textbox 6.2: Panchakanya Irrigation System in Chitwan District

This irrigation system is located in the Inner Terai of Central Nepal, in East Chitwan. The indigenous Tharu people built an irrigation canal about 200 years ago to serve an area of approximately 100 ha for paddy irrigation. Until the 1960s, a Tharu headman or *jimindar* (landlord and tax collector) was responsible for the organization of agriculture and irrigation. In the 1950s, after malaria eradication programmes of the government, upper-caste migrants from the Hills settled in the area and gradually took over the system. By 1974, the system was formally taken over by the DOI after migrant farmers had approached the government for system expansion. In 1988, an irrigators' group established by the migrant farmers was informally acknowledged by the DOI.

The system was expanded in the 1970s for a designed command area of 600 ha under the Chitwan Irrigation Project (in total covering three sub projects for about 10.400 ha), with a small reservoir, a 5 km long main canal and 8 branch canals. After construction, the DOI took the responsibility for gate operation, but water distribution and maintenance remained organised by the farmers.

...to be continued on the next page

continued from the previous page...

In 1994, the DOI started negotiations with the irrigators' group of Panchakanya for a 'hand over' of the system to users under a new policy of PIM. The farmers agreed on the condition that the system was rehabilitated. In 1998, a second rehabilitation for 450 ha was concluded and the system was officially transferred to a formal and newly created multi-tiered WUA to assure users' participation at all levels. The WUA expanded gradually from a group of a few farmer leaders in 1994 to a multi-level organization in 2008 with 198 members in the General Assembly, a main committee, and branch and outlet committees. The WUA achieved high levels of users' participation in the period 1994-2008, and largely, though not completely, operated the system without external assistance. In this context, the DOI calls Panchakanya a model of 'FMIS' for Nepal and the system continues to be seen by irrigation professionals as an example of farmer-management.

Members of the main committee of the WUA sharing laugher (2010)

The Panchakanya Irrigation Project is counted in the DBID under 'Chitwan Irrigation Project' in the category of 'DOI surface projects' (see Table 2 of the DBID, p.11).

Source: DOI, 2000; DOI/CERD, 2007: IWMI/FAO, 2009; Liebrand and Singh, 2012.

Noteworthy in this context is also that groundwater systems under control of farmers are not categorized as 'FMIS' in irrigation data, while irrigation literature in Nepal does talk sometimes about 'farmer managed groundwater irrigation systems' (Ansari and P. Pradhan, 1991). As noted, the experience of the COP of the Irrigation Organisation has always mainly been about the use (and potential benefit) of surface irrigation systems, managed by the state. In this experience, state management of groundwater irrigation has played a minor role which has been reflected in the high levels of user participation in the implementation of most groundwater irrigation projects in Nepal by the DA and ADB-N. This particular case illustrates that 'FMIS', as adopted and used in the irrigation data, is not applied to all farmer-managed irrigation systems. In the experience of the COP of the Irrigation Organisation, 'FMIS' primarily has meaning, and is mainly expressing customs and particular beliefs, in relation to the management of (traditional, rehabilitated) surface irrigation systems.

6.3.5 The reality of data on irrigation: The enactment of P/A/STHA

So what do the irrigation data do? What reality do they enact and for whom are the data on irrigation a self-referential expression of experience? As presented above, the show of the irrigation statistics can (also) be seen as a creative piece of cultural performance, a ritual drama that enacts a particular reality of (state) irrigation development in Nepal. At times, the show appears too straightforward to exist, but nonetheless, the irrigation data persuasively perform a reality. To recall, the argument is not that the 'reality' of irrigation data replaces or explains other realities of irrigation water use, it is to show that the irrigation data enact a reality that subsists alongside other realities, such as those experienced by farmers and field-level irrigation personnel, also to expose that the irrigation data (continue to) structure the experience of members in the COP of the Irrigation Organisation on a liminal level and concretely, in the practice of policy making and programme design. It does so in the sense that the numbers and categories, quite literally, link the project or agent that is believed to control or manage the system (DOI, DA, ADB-N or farmers in FMIS), to a particular source of water for irrigation (surface or groundwater), to a certain type of technology (canals, wells or small irrigation techniques) and to an anticipated irrigated area measured in hectares. In short, the 'facts' on irrigation can be seen to reflect and structure an experience in the COP of the Irrigation Organisation of PROJECT/AGENCY > SOURCE > TECHNOLOGY > HECTARES. Hereafter, I call this the ritual display of P/ASTHA.

For instance (see Table 6.2), 'DOI project' (P/A), listed under 'surface irrigation' (S), a label that also represents an irrigation scheme type – in this case, open canal systems (T) – is shown to account for an anticipated irrigated area depicted in hectares (HA). Or, 'non-assisted FMIS' (P/A), also listed under 'surface irrigation' (S), for 'rehabilitation' of canal infrastructure (T), is shown too to result in a stipulated area for irrigation (HA). And a last example, 'ADB-N' (P/A), presented under 'groundwater irrigation' (S), under 'shallow tube well' (T), is likewise expected to result in an increase of the irrigated hectares (HA). In essence, the ritual display of P/ASTHA, in the practice of reproducing and showing irrigation data, is a process of 'culture in the making'. It is a stylized repetition of acts among members in the COP of the Irrigation Organisation, an example of ritual behaviour of irrigation specialists that reproduces and expresses shared customs, traditions and particular beliefs on the profession.

This is what irrigation statistics do: the ritual display of P/ASTHA, as represented in the irrigation data, is one of the most visible self-referential expressions of (liminal) experience and (concrete) professional practice in irrigation governance. It reflects and structures the wider networks of support and validation that exist among the members in the COP of the Irrigation Organisation, and it helps to enact professional credibility and claims of truths of engineers and state planners. To re-iterate, as noted above, the construction of irrigation data in Nepal follows scientific criteria and international professional norms, and the performance of P/ASTHA needs thus to be understood as a product of group work and interaction among foreign and national members in the COP of the Irrigation Organisation. This implies, for instance, that the 'engineering biases' in irrigation professionalism, as they are expressed in the performance of P/ASHA, do not exclusively lie with civil engineers in the DOI but also with foreign (irrigation) practitioners – something that Western development practitioners appear liminally aware of in their critique on professional behaviour in the technical agencies of the state (see the Canadian-authored report of WECS, 1981 for Nepal; and Chambers, 1988 for canal irrigation in India). It also is important to note that the performance of P/ASTHA, as a self-referential expression of experience of individual irrigation professionals, forms the main source or reference for reflection. Illustratively, every specialist, engineer or professional, can explain about engineering biases in the irrigation statistics and everybody knows about the relevance of crop knowledge and conjunctive water uses in irrigation. However, when individual irrigation professionals perform as a group and communication starts to flow according to accustomed and ritualized patterns, then the outcome – the process of engagement and reflection – is the performance of P/ASTHA.

6.4 Performances of "masculinity" in the COP of the Irrigation Organisation

The performance of P/ASTHA can be seen as an expression of gendered thinking in irrigation professionalism, because it is mainly 'men' as engineers and irrigation professionals who are involved in the construction of irrigation data. This also can be said, because the performance of P/ASTHA helps to enact professional credibility and claims of truths of mainly 'men' as engineers and state planners, translating into hierarchies of knowledge, power and gender. This leads to the hypothesis that data and policy on irrigation can be considered as cultural agents that enact masculinities and professional identities in irrigation. In short, the performance of P/ASTHA can be assumed to enact professional knowledge *as well as* the masculine identities associated with that knowledge. In the remaining part of the chapter, I rework the numbers of the DBID database and I scrutinize the ADB report to bring into existence an argument how irrigation data might be seen to perform as an expression of professional identities and masculinities in irrigation.

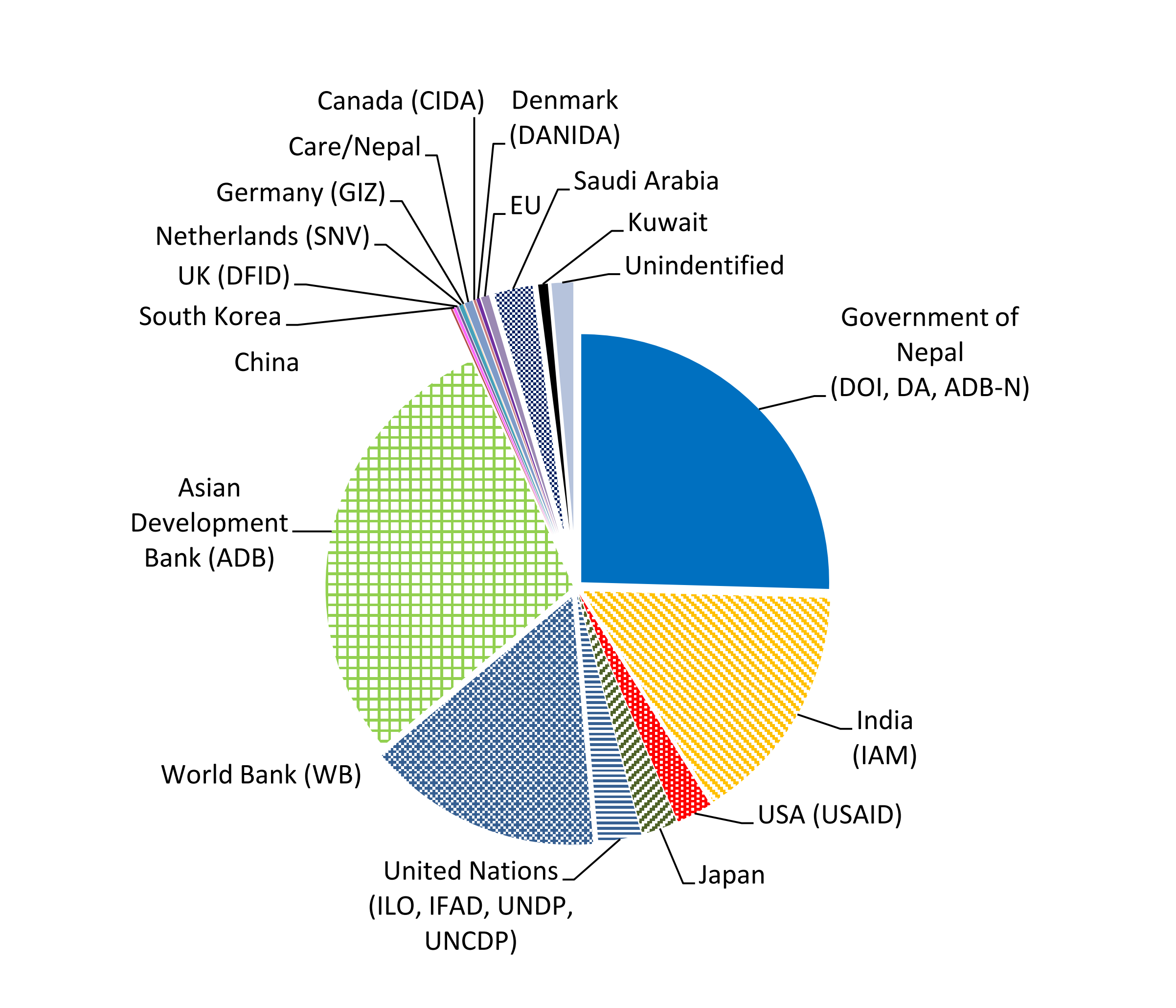
To recall, the whole interpretative community of the COP of the Irrigation Organisation in Nepal is numerically dominated by male professionals – not just the DOI. The whole public administration in Nepal is dominated by men (see Chapter 2), most NGOs that run irrigation programmes in Nepal employ men (Karmacharya *et al*., 2003), engineering consultancy firms in Nepal hire predominantly men, international irrigation conferences in Nepal attract mainly male participants (HMG-N/FAO, 1976; HMG-N/ADC, 1983; IIMI/WECS, 1987; P. Pradhan *et al*., 2010), and foreign water resources experts in Nepal – consultants, donor officials– also tend to be men (WECS, 1981; DOI/WB/UNDP, 1989). This does not mean that all these 'men' have the same professional identities and are performing the same masculinities. Members in the COP of the Irrigation Organisation are men with diverse backgrounds. To understand how this relates to the performance of P/ASTHA – and to understand whose identities (and masculinities) we should talk about – this section investigates the background of members in the COP of the Irrigation Organisation along the intersections of nationality, professional discipline, institutional affiliation and gender, caste and ethnicity.

6.4.1 Intersection one: Nationality and foreign aid

Figure 6.4 presents the countries and organizations that have provided funding for the irrigation sector of Nepal in the period 1950 to 2005, based on a reworking of the numbers in the DBID. The 'agency assisted irrigated area' has been taken as a reference point, measured in hectares (DOI/CERD, 2007).[47] When following the figure clockwise, it shows the countries and organizations that have been involved in the funding of irrigation projects first, and which followed later. The purpose of the figure is to illustrate that there is basically no irrigation project in Nepal that has been implemented without the assistance of donors and foreign aid organizations, and also to show that the associated professional diversity in terms of 'turn-over' of foreign experts is a distinct cultural characteristic of the COP of the Irrigation Organisation in Nepal. Illustratively, my short appearance as a Dutch PhD student doing studies in Nepal on irrigation was no surprise to most DOI engineers. The penetration of foreign presence went further than financial and technical planning. In many projects, foreign countries have been directly involved in the construction of irrigation projects through the placement of 'resident engineers', notably India and international aid organizations like the British 'DFID' and the Dutch 'SNV' (see Textbox 6.1 for an example).

[47] Figure 6.4 depicts the irrigated hectares that are funded by a particular country or organization. It does not show the amount of funding in terms of US dollars or the amount of investment per hectare.

Figure 6.4: Origin of funding for the agency assisted irrigated area in Nepal (1950-2005)



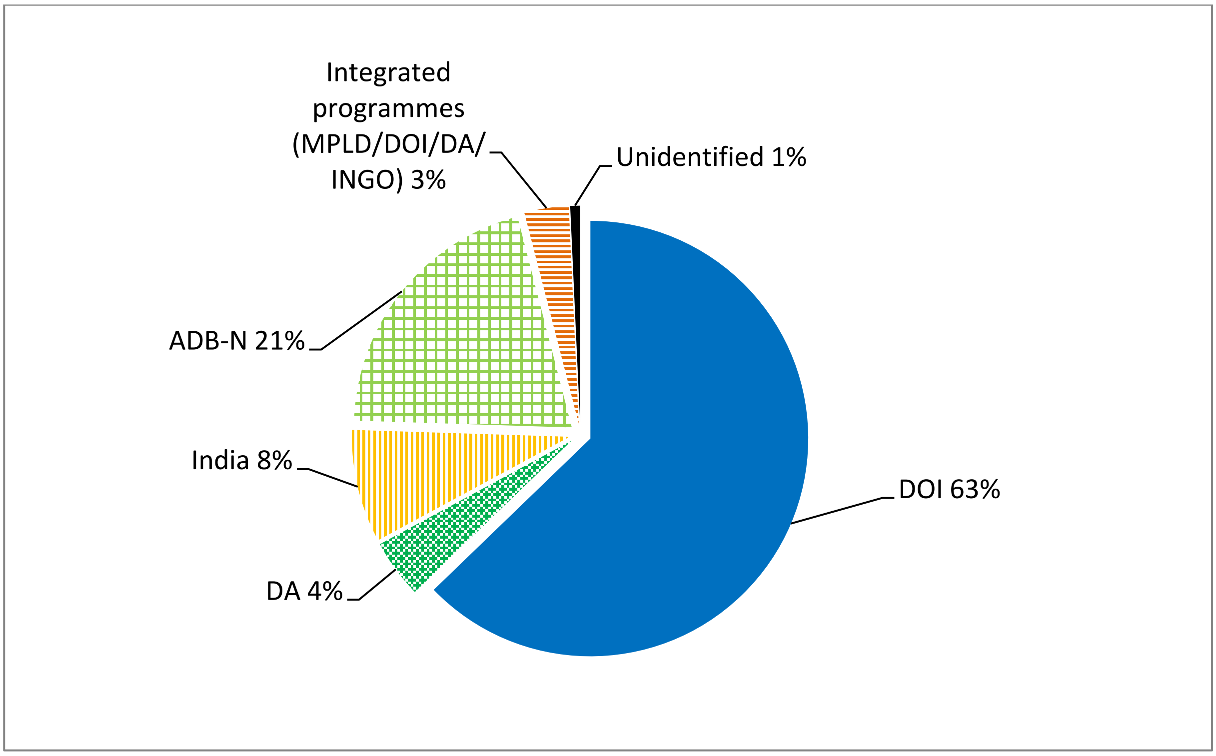
Source: DOI/CERD, 2007. See Annex 46.

The reality of Figure 6.4 is one way to show that the COP of the Irrigation Organisation in Nepal always consisted of members with diverse national backgrounds: Nepalese, Indian, Southeast Asian and Western professionals. In addition, the UN, WB and ADB hired staff for their missions around the world, and most countries and organizations depicted in Figure 6.4 worked with foreign consultants in project formulation. For instance, the German consultancy firm Agrar und Hydrotechnik GMBH was hired in 1972 to conduct studies for the Chitwan Valley Development Project, a big irrigation project in Chitwan District funded by the ADB (ADB/Agrar, 1972). Likewise, the Japanese consultancy firm Nippon Koei Limited was hired in the late 1980s for feasibility studies on the East Rapti Irrigation Project in Chitwan, also funded by the ADB (DIHM/ADB/Nippon Koei, 1985). The role of foreign specialists in irrigation governance in Nepal reveals that the performance of P/ASTHA is a ritual practice with strong international 'diversity' dimensions. It can thus not be discarded as a national (and masculine) practice that is typical for Nepal.

6.4.2 Intersection two: Institutional affiliation and professional discipline

Figure 6.5 presents an overview of the executing agencies for state irrigation development in Nepal in the period 1950-2005, based on a reworking of the numbers in the DBID for the ‘agency assisted irrigated area’ (DOI/CERD, 2007). Figure 6.5 illustrates that no less than 36% of this area has been developed by organisations other than the DOI, notably the DA, ADB-N, MPLD and INGOs like SNV. It is important to note that direct foreign participation in the *execution* of irrigation projects is hardly visible in Figure 6.5, except for India. Within the borders of Nepal, the executing authority of irrigation projects is officially the government of Nepal. For instance, the systems built by Indian engineers of the River Valley Projects Department of Bihar in the Nepalese Terai in the 1960s, 70s and 80s are documented in the DBID as ‘DOI projects’, because the government of Nepal had entered into agreements with the government of India (Poudel, 1986). Since the 1980s, many of the ‘Indian’ systems have undergone rehabilitation and expansion under new irrigation programmes, this time executed by the DOI. Therefore, for the presentation of Figure 6.5, I have divided the area of these big irrigation systems equally between the ‘DOI’ and ‘India’. For other irrigation projects that have been implemented with Indian or other foreign engineers, this method is not possible, because they have been executed in much closer cooperation with DOI engineers and other national counterparts (examples are the Minor Irrigation Project in the 1960s and the integrated rural development programmes like the Mechi project in the 1980s and 90s).

Figure 6.5: Agencies for the agency assisted irrigated area in Nepal (1950-2005)



Source: DOI/CERD, 2007. See Annex 47.

Figure 6.5 illuminates for the national level, that members in the COP of the Irrigation Organisation have always consisted of professionals with diverse disciplinary backgrounds. In short, there are the civil engineers of the DOI and irrigation departments in India, and there are the agricultural experts and economists from the DA and ADB-N. 'In between', we can assume the position of specialists with training in hydrology, rural planning, and sociology. Though not depicted in Figure 6.5, these disciplinary backgrounds also existed among staff of donor and international aid organizations. As noted in Chapter 1, a high-level planning officer of the NPC observed in the 1980s in this context the existence of two 'old establishments', the 'irrigation organisation' and the 'agricultural organisation' (B.B. Pradhan, 1982: 4). These COPs can still be seen to exist today. The COP of the Irrigation Organisation has a strong orientation towards the discipline of civil engineering, focussing on construction, and the COP of the 'agricultural organisation' has a strong orientation towards the discipline of agricultural science and rural extension. Generally, it can be said, that the field of agricultural and rural extension has always employed a significant number of women professionals, also in Nepal (see Chapter 2), unlike the field of civil engineering. The role of various institutions in state irrigation development in Nepal, and the position of the COP of the Irrigation Organisation in relation to agriculturalists and extension workers, suggests that the performance of P/ASTHA is a ritual practice with strong 'institutional', 'engineering', 'competitive' and 'masculine' dimensions, both at the national and the international level.

6.4.3 Intersection three: Gender, caste, ethnicity

To examine the dimensions of gender, caste and ethnicity in the COP of the Irrigation Organisation, as they exist today, I have analysed the background of the professionals and actors that have contributed to the ADB report (2012a). As noted, this report was prepared by three authors, all men. The first author is a foreign consultant from the West, specialized in irrigated agriculture and water resources.[48] The second and third author are both upper-caste Nepalese consultants, an irrigation expert and micro-irrigation specialist respectively.[49] In total, 127 persons are acknowledged for their views in the report. A core group, called the 'Irrigated Agriculture and Water Resources' (IAWR) team provided comments and suggestions, and its members reviewed draft versions of the report. In addition, 109 persons from various organisations were consulted for their views.[50] The listing of the names and the professional affiliations in the ADB report (2012a) allows for a 'body count' to get to know

[48] Presumably, he is from America and trained in economics but I have been unable to verify.

[49] The second author is a civil engineer by training (Bachelor degree). He also obtained a Master degree in engineering from the Asian Institute of Technology (AIT). I have been unable to verify the disciplinary background in the education of the third author.

[50] This report was prepared for the 'Assessment Report' on the 'Preparation of the Agricultural Development Strategy' of the ADB for Nepal (ADB, 2012b). The Assessment Report draws upon consultations and analytical work conducted by the Technical Advisory Team (TA team) of consultants in collaboration with senior officers of the Ministry of Agriculture and Cooperatives in Nepal.

the gender, caste and ethnicity of the professionals and actors, and the organisations they are employed with. Table 6.5 presents an overview of the body count in five ‘stakeholder’ groups, namely the government (mainly civil engineers and agriculturalists), donors, users, NGOs and others (consultants, research institutions, businessmen). Table 6.5 can be considered an up-dated representation of members in the COP of the Irrigation Organisation, differentiated between ‘core’ members and ‘consulted’ (or peripheral) members.

The intersections between nationality (and foreign aid), institutional affiliation and professional discipline come together in Table 6.5. It shows that agencies under the government are the most dominant professional group in policy formulation. The MOI and its departments and divisions provided for 9 out of 18 members in the core team, followed by the Ministry of Agriculture and Cooperatives and its departments, which sent 5 members.[51] The second most important group, in terms of numerical participation, is the donors, notably representatives of the ADB and the UN. Other persons in the core team are representatives of the National Federation of Irrigation Water User Associations (NFIWUAN) and IDE, an international NGO that is actively promoting ‘non-conventional’ irrigation in Nepal. Other stakeholders consulted for the study were representatives of various NGOs and INGOs, IWMI, irrigation sector consultants, businessmen and local government representatives. As noted, the listed persons can be considered members of the COP of the Irrigation Organisation, but at the same time the professional hierarchy of the COP of the Irrigation Organization and the COP of agricultural specialists can be seen to cross-cut the most dominant stakeholder groups, respectively the government and donors. Professionals working for the DOI and irrigation sector consultants, as well as some employees of the ADB, can be considered members of the COP of the Irrigation Organization, while professionals employed for the DA, as well as some officials of the ADB presumably see themselves (also) as part of the COP of agriculturalists.

[51] The ADB study mentions that representatives of the Department of Local Infrastructure Development and Agricultural Roads (DOLIDAR) and the WB were invited to participate in the core team, but that were unable to attend the meetings (ADB, 2012a).

Table 6.5: Professionals and actors contributing to the ADB report

Agency (or actor)		**'Core team'**	**'Consulted'**
GOVERNMENT	Ministry of Irrigation (MOI)	//	//
	Water and Energy Commission Secretariat (WECS)	/	/
	Department of Irrigation (DOI)	///	### ### ### ///
	Department of Water Induced Disaster Prevention (DWIDP)	/	//
	Groundwater Resources Development Board (GWRDB)	//	### /
	Ministry of Agriculture and Cooperatives (MOAC)	///	///
	Department of Agriculture	//	### ### /
	Department of Local Infrastructure Development and Agricultural Roads (DOLIDAR)		###
DONORS	Asian Development Bank (ADB)	/	///
	World Bank (WB)		//
	UN: International Fund for Agricultural Development (IFAD)	/	
USERS	National Federation of Irrigation Water User Associations Nepal (NFIWUAN)	/	///
	WUA and farmer leaders		### ### ### ###
NGOs	NGOs and INGOs (IDE, INPIM/N, JVS-NWP, SAPPROS, CEAPRAD, Practical Action)	/	### ### ### ### ///
OTHERS	International Water Management Institute (IWMI)		/
	Irrigation sector consultants		///
	Businessmen		###
	DDC representatives (local government)		/
	TOTAL	**18**	**109**

Source: ADB, 2012a

An inspection of the names of the professionals reveals the intersections between gender, caste and ethnicity. The core group consisted fully of male specialists, namely 12 upper-caste Nepalese men, 5 Nepalese men with a Newar background, and 1 Caucasian American man. Likewise, the people consulted for the study consisted largely out of upper-caste Nepalese and Newar men, and six foreign representatives of donors and the consultancy sector, namely from the Netherlands, China, Canada and three from America.[52] The only two women professionals that contributed to the report were a Caucasian Canadian and Caucasian American representative of the ADB and WB respectively, listed as a 'Senior Water Resources Specialist' and 'Water Resources Officer' respectively (ADB, 2012a; see p.196-197).[53] The analysis and this counting exercise illustrates that there is significant diversity among men, in terms of nationality, professional discipline, and caste and ethnicity. It also illuminates that this diversity is hierarchically institutionalized through employment and the activities of organizations like the DOI and the ADB. It is here that we come at the heart of the matter, knowing the diverse but almost exclusive male background of members of the COP of the Irrigation Organisation, it can be argued that the performance of P/ASTHA in irrigation data helps to enact the professional identities associated with engineering and infrastructure development in irrigation as well as the masculinities associated with those professional identities across national and institutional borders.

6.5 Conclusions

The objective in this chapter has been to show that data in policy on irrigation, in addition to its 'technical' and 'instrumental' dimensions, can also be considered a 'cultural expression' of authority, professional identities and masculinities in irrigation governance. The analytical approach of cultural performance has been put to the test, contrasting and comparing 'shows' of irrigation data in policy; one I brought into existence through a faithful translation of irrigation data (the show of mainstream irrigation data), and others through examining irrigation data by looking to descriptions of farmers' experiences (deconstructing the show of mainstream irrigation data) and constructing a show myself by using the data (reworking the numbers and information in the data and policy documents). This method can be considered a relatively straight-forward approach to study the performativity of data and policy, and to get revealed some of the gendered thinking in irrigation knowledge.

Through a layered analysis of the mainstream irrigation statistics in Nepal, by taking apparent 'inconsistencies' in the data as a lead, and by comparing the reality of the data with those described in literature for farmers, I have shown that the irrigations statistics create a reality but only in the context of its own numbers. I also have shown, through an historical analysis

[52] The group that was consulted for the study in the field included some people from ethnic minorities, such as Gurung, Tharu and Muslims.

[53] The Water Resources Officer of the WB is an economist focusing on water resources policies.

of irrigation data in Nepal, that the ritual display of numbers always has followed a certain pattern, identified in this chapter as the performance of P/ASTHA. This is then what the irrigation statistics *do*, they reflect and structure (Turner and Bruner, 1986), or describe and enact as others say (Latour and Woolgar, 1986; Law, 2009), an experience of the COP of the Irrigation Organisation that is marked by beginnings (underdevelopment, no irrigation), middles (development, irrigation projects), and endings (modernization, a fully irrigated country), showcasing and constituting how engineers and irrigation professionals mainly of the male gender 'think about' (state) irrigation development in Nepal. I have shown that this experience can be traced back to the first-generation of irrigation engineers and policy makers in Nepal, and is kept 'alive' and reworked in complex ways through the performance of P/ASTHA – as illustrated by the changing categories and numbers in the data on irrigation.

The identification of the performance of P/ASTHA with 'male experience' and 'male thinking in irrigation' is not to say that women professionals in irrigation would use and construct irrigation data in a different way. It is to say that data on irrigation are a cultural expression of professional performance through which irrigation professionals create credible voices and identities for themselves, and to say that those voices and identities mainly are associated with men and male engineers, assigning masculine connotations to the use of irrigation data. This implies that authority 'sticks' more easily to male engineers when they use irrigation data, than to female engineers when they use irrigation data. Or, to explain it with the professional performances that have been brought to the stage of this book, in the use of irrigation data, authority is more likely to stick to the Irrigation Man and the Water Emperor (and their male successors) than to lady engineers in the DOI.

In the end, the ritual display of P/ASTHA is utterly straightforward. It reflects the engineering biases that prevail in the COP of the Irrigation Organisation on the construction of infrastructure. In the core, these biases in irrigation are about setting 'hectare targets' for development, a practice that is interpreted in this chapter as a stylized repetition of acts. This means that it partially is customary behaviour, functioning as a self-referential (liminal) practice for irrigation professionals; a process that disciplines them as individual agents. To re-iterate, the setting of hectare targets is an international practice – not something that is typical for Nepal alone. To illustrate, the online irrigation and drainage database of the FAO, AQUASTAT also documents the status of irrigation development in terms of hectares.

If the ritual display of P/ASTHA disciplines male and female irrigation specialists and re-produces masculinities, mainly among foreign and national engineers in the COP of the Irrigation Organisation, as the analysis on the intersections suggest, then it also must offer scope for resistance and subversion. The question here is whether the performance of P/ASTHA is really hegemonic and really so resilient to change as suggested by the analysis.

Evidently, P/ASTHA is (still) practiced and going strong. The show of mainstream irrigation data continues to structure and portray the incorporation of agricultural knowledge or crop performance indicators, such as cropping intensity or yield, as irrelevant – there are simply no categories to put the numbers in. For this, a very different ritual display would be required, for instance, the hypothetical show of PROJECT (P) > INPUT (I) > HARVESTED AREA (HA) > YIELD (YI) (PIHAYI). A performance of PIHAYI would reflect and structure a (liminal) experience and (concrete) policy discussions in agriculture and irrigation in a radically different way, and it would require very different professional performances. Concretely, the question would then be what type of project is most successful for achieving higher yields (infrastructure development, technology transfer, land reform, farmer training), and what type of input would achieve a maximum harvested area (irrigation, roads, fertilizer, new rice varieties, pest control, rural credit, farmer extension).

At the same time, the ritual display of P/ASTHA is not totally hegemonic – it cannot be. To recall, cultural performance is a theory of reflection and how reflection is structured (see Chapter 1). Performances reflect and structure communication as a self-referential experience and the performance of P/ASTHA is no exception. Illustratively, the customary practice of setting hectare targets in state irrigation development was openly critiqued in Nepal as early as the 1970s, not least by members in the COP of the Irrigation Organisation. The earlier mentioned report of WECS (1981), written by Canadian consultants in consultation with high-level Nepalese irrigation engineers of the DOI, talks about a 'fundamental problem' and stated that '[o]bjectives such as "increasing the area of irrigation" (by so many hectares) and "increasing the utilization of Nepal's vast water resources" can both be satisfactorily fulfilled with absolutely no benefit to Nepal' (WECS, 1981: 56). Also the second irrigation master plan for Nepal criticized the practice of assigning hectare targets to the DOI (DOI/WB/UNDP, 1989), and at the 'National Irrigation Seminar' of 2010, a senior divisional engineer of the DOI, once again, asked attention for the practice of assigning '"hectare targets" to [the] DOI' (Khanal, 2010: 60). It is here, in the capacity of the performance of P/ASTHA to structure communication as a self-referential and self-reflective experience, that alternative uses and presentations of irrigation data can be identified to build upon as new profiles for professional performance.

Chapter 7:

Our knowledges ourselves: A self-portrait of irrigation knowledge[54]

7.1 Introduction

In this chapter, I re-construct a history of irrigation and water management of Chitwan District in Nepal, focussing on the period 1950-2010. As in Chapter 6, the goal is to explore how gender and masculinities might be implicated in 'our knowledges' in irrigation and water expert thinking. Speaking about 'we' and 'our knowledges' is deeply contentious from a feminist perspective, but I have a reason for it. Acknowledging my subjectivation as an irrigation professional and researcher in development, I talk about 'our knowledges' in an attempt to invite fellow members of knowledge and policy elites in development to participate in an exercise of self-discovery. In recognition that this community in development itself has various forms of knowledge, I consistently refer to 'our knowledges' – with an 's'. With 'our knowledges', I refer thus to a broad and diverse body of expert knowledge that is produced in the COP of water professionalism – not only in the COP of the Irrigation Organisation or in the DOI in particular. Members in the COP of water professionalism in Nepal and elsewhere belong to knowledge and policy elites in development, and they come from various (inter)disciplinary and institutional backgrounds; they may work for government organisations, universities (like myself), research institutions, consultancy firms, NGOs or lending agencies, and they may be irrigation engineers, planners, economists, agriculturalists, sociologists or gender specialists (cf. Wilson, 2006). In short, 'our knowledges' refer very broadly to histories of irrigation development in Nepal as 'we know them'. I suggest that it is worthwhile to scrutinize our expert knowledges in irrigation and the 'things we know' (or once knew) in the recognition that performances and identities of 'ourselves' – as male and female professionals – are somehow implicated in it (Wilson, 2008). More specifically, in re-constructing narratives of state irrigation development in Chitwan and treating the account as a self-referential experience or self-portrait of professional performances in irrigation, it might be possible to see how masculinities have been (and are) associated with our expert knowledges. A self-portrait of professional performances may facilitate self-discovery, or as Law and Singleton (2000) say, 'technological storytelling' enables us to analyse how 'our descriptions interfere with other performances of technoscience to prop these up, extend them, undermine them, celebrate them, or some combination of these', and 'with arrangements that are explicitly political', having to do, for instance, with gender (p.769-770).

[54] I am paraphrasing the title of an article of Wilson (2008) 'Our knowledge ourselves: Engineers (re)thinking technology in development', published in the Journal of International Development, 20: 739-750.

In analysing technical representations of data in policy on irrigation in Chapter 6, I have suggested that an enduring (and hegemonic) experience of professional performance in irrigation expert thinking can be traced back to the 1950s and 60s – the time of the first-generation of state planners and irrigation engineers in Nepal. This suggestion is further explored in this chapter. The 1950s and 60s were perhaps the 'formative' years of a new bikas hegemony in Nepal, but much has changed since then, also in professional practice in irrigation in Nepal and elsewhere. As Wilson (2008) notes in general, a re-conceptualization of technology (and science) in development is claimed to be taking, or has recently taken place (p.739). The new approaches have in common a pluralist, constructivist conception of knowledge and they conceptualize the field of technology as located among other knowledge systems with which it interacts. In this view – resonating with the concept of governance – technology is negotiated and irrigation knowledge and water expert thinking is produced through inter-subjective engagement between different knowledge actors (after Wilson, 2008: 740). Indeed, negotiations on engineering projects and public works 'are rarely only about project design or the location of administrative authority, but also involve visions of the past and future expressed in custom, values and written and oral traditions' (Reuss, 2008: 532). The question remains, however, as Wilson (2008) points out, what 'professional technology actors' *themselves* make of their role in development (my emphasis) (p.740). More specifically, as Wilson (2008) phrases it, in practices of 'sense-making' in technology implementation, it is important for engineers to participate in the projection of positive self-identities in working with other professionals, and also to develop shared experiences in development of 'can do' and 'doing things together' (p.744, 748-749).

In this chapter, I hypothesize that some of these 'shared experiences' of irrigation engineers and water professionals in Nepal in regard to irrigation expert thinking, are related (and still relate) to what can be conceived as an overarching experience of the 'hydraulic mission'. The hydraulic mission is defined as 'the strong conviction that every drop of water flowing to the ocean is a waste and that the state should develop hydraulic infrastructure to capture as much water as possible for human uses' (Wester, 2008: 10; see also Molle *et al*., 2009). This literature is not dealing with Nepal, but I suggest that the concept is useful for the construction of a self-portrait of irrigation expert thinking in Nepal because it captures important qualities in the experience – how Victor Turner defines it – of the first-generation irrigation engineers and state planners in Nepal, and it appears also in many of their successors in the DOI and MOI (see Chapter 6 for an example of an enduring experience in the use of irrigation data). The use of the term 'mission' alludes to military and religious connotations and reflects the conviction that it is an important duty of the state to develop water resources. The main carrier of this mission is the (national) hydraulic bureaucracy, also known as the hydrocracy, which sets out to tame nature by 'developing' water resources for the sake of progress and benefits for mankind. In Nepal, the DOI, MOI, WECS, NWRDC and also the Ministry of Power (MOP, previously under the MOWR), can be seen as the main agencies in the hydrocracy (embedded in the COP of the Irrigation Organisation). A Nepalese version of the hydraulic mission is perhaps also known as the seductive dream that Nepal will become prosperous when it uses its full irrigation and hydropower potential (Gyawali, 2001). Here, I use 'hydraulic mission' to frame a re-construction of irrigation development in Chitwan, using it as a backdrop to see how engineers and other professional technology actors have acted as negotiators of our knowledges, also creating shared experiences and positive self-identities.

Chitwan is not primarily known in Nepal for its 'development achievements' in the field of irrigation and water resources engineering, but I selected the district because it can be considered the first Terai district that was targeted for modernisation in the 1950s (Mihaly, 2002 [1965]). The district's close proximity to the capital, the perceived 'under use' of land and water resources in the (inner) Terai in comparison with the Hills, and its educated and politically conscious population have always been considered favourable conditions by knowledge and policy elites to test and implement new (water) development projects. In constructing a self-portrait of state irrigation development in Chitwan, I have made use of a perhaps unconventional categorization of time and space in Nepal, namely: (a) the time before the hydraulic mission, focussing on Chitwan District (before the 1950s); (b) the introduction of the hydraulic mission, focussing on the high policy level in Nepal and how Chitwan featured in the debates (1946-1970); and (c) the implementation of the hydraulic mission, focussing again on Chitwan District (after 1950). The focus is mainly on events that took place in the late 1940s, 50s and 60s. As explained, these decades can be seen as the 'formative' years of a hydraulic mission in Nepal, arguably hegemonic since then.

For clarification, the historical account here is a 'self-portrait' (or rather many self-portraits) of professional performances in irrigation expert thinking in Nepal that I have constructed *myself*. I have done this through a critical reading of our knowledges (original policy documents and project plans, empirical research in Chitwan on irrigation, scholarly literature on the district), as well as through fieldwork in the period 2009-2011 (inspections of infrastructure, interviews with farmers, consultations with engineers of the DOI office). It can be seen as a performance of professional expertise, an act of showing that I know our knowledges, negotiating the masculinities that are associated with it – ultimately with the goal to make performances of masculinity visible in irrigation. I focussed my analysis on the introduction of new ideas on development and the persons who brought them to Nepal, and also on how projects have been implemented and how (some of the) meanings of modernity (and of masculinity) have been negotiated in the process. In the presentation of the history, I extensively make use of maps and photos of Chitwan that I came across in libraries, in documents and on photo boards in the local irrigation office, showing 'shared experiences' and 'positive self-identities' of rulers, planners, experts and engineers in relation to the district. Some of the photos represent rare images of Nepal (from the pre-1950 period). I also have added photos on Chitwan that I have made myself. To re-iterate, to tell technoscience stories is to perform technoscience realities as Law and Singleton (2000) posit. This is not to say that what I present here is empirically wrong. Rather it is to say that I present a 'particular and located enactment or performance of technological knowledge and practice' (p.767), also bringing (back) into existence – and hopefully for us to see – some of the performances of masculinity of 'ourselves' in irrigation knowledge and water expert thinking.

The next section elaborates on the concept hydraulic mission and how I used it in analysis. Then, an introduction on Chitwan District follows. The subsequent three sections present the three periods in the order mentioned above and the chapter finalizes with conclusions.

7.2 The hydraulic mission: Hegemony, knowledge and masculinities

Using the concept of the hydraulic mission in the construction of a history of irrigation expert thinking can shed some light on the associations between hegemony, knowledge and masculinities in it, and it might tell us how projects of state irrigation have (simultaneously) functioned as 'projects of hegemony' and perhaps also, as 'projects of masculinity' and perhaps then also as 'projects of hegemonic masculinity' (Connell, 2005 [1995]). To recall, the introduction of new ideas on development or the implementation of a new irrigation project may cause potential disruptions in the gender order, but they also may form part of strategic responses to restore a position of power, prestige and authority in the prevailing gender hierarchy, associated with masculinities. In my view, the term hydraulic mission captures associations with hegemony in state irrigation development and also associations with masculinities in it, particularly through the military connotations of 'mission'. The 'masculine' names of the Irrigation Man and Water Emperor can be seen to obtain meaning in relation to 'their' (hydraulic) mission in state irrigation and vice versa. Zwarteveen (2011) is one of the few who notes that the hydraulic mission and men – as engineers and state planners – seem inseparably connected, but a gender politics in the mission has not been articulated other than that it is a politically contested project (Wester, 2008; Molle *et al*., 2009).

Using the term 'hydraulic mission' in a study on the relations between irrigation expert knowledge, hegemony and (hegemonic) masculinities in professional performance is not without problems. First, it can be argued that the term has limited applicability for Nepal. The contrast between convictions and actual implementation in Nepal, between 'over-hyped expectations' and 'hard-headed economic realism' (Gyawali, 2009: 296), has often been so sharp that it can be difficult to establish the relations between the two. The implementation of irrigation and water resources development has a very chequered history in Nepal. It is one that is marked by continuities and discontinuities and one that is generally seen as a case of 'failed development' (Panday, 2009 [1999]; see also Dhungel and Pun, 2009). In this context, it is clear that the hydraulic mission cannot be studied in Nepal as a sweeping story of dam and canal infrastructure construction, as it sometimes appears to be presented in literature.

Second, the term 'hydraulic mission' as defined above, (also) can be interpreted as a static and somewhat a-historical mind-set in the hydrocracy. Such an interpretation would create many problems, particularly for a study on hegemony and how it is tied up with state irrigation development. A Gramscian hegemony is a historically mobile relation, one that embodies the currently accepted answer to the way society is and functions 'normally' (see also Chapter 1). This is also true for performances of hegemonic masculinity, as norms of Elite Manhood can be seen to change through time in the COP of the National Elite. Hegemonic relations and related performances of hegemonic masculinity, legitimize – and recursively build upon – practices like state expansion, the domination of Western science, patterns of resource use, class differences and social norms like the caste system and 'patriarchy' in Nepal (Tamang, 2002; Connell, 2005 [1995]). 'How' exactly, however, is a question of time and context. In short, if relations between the hydraulic mission and hegemonic experience in irrigation expert thinking are to be explored, the application of a very 'strict' definition of the conviction of the hydraulic mission should be avoided.

Third, the 'hydraulic mission' (also) can be interpreted as a strong modernist conviction that primarily has travelled one way, from the West to the Third World, or from the North to the South. Also this interpretation creates problems, closely related to the points mentioned above. In literature, the hydraulic mission is defined as a 'high-modernist' world view (see Wester, 2008: 10). Scott (1998) defines high-modernism as a strong belief in scientific and technical progress, associated with industrialization in Western Europe and North America from roughly 1830 until World War I. It is a form of modernisation that is characterized by a supreme self-confidence about continued linear progress, the development of scientific and technical knowledge, the expansion of production, the rational design of social order and the growing satisfaction of human needs (p.89-90). He also defines it as a state ideology, legitimizing state expansion and the administrative ordering of nature and society through the state's monopoly on the legitimate use of force and its centralized agencies. In this definition, the hydraulic mission is portrayed as a relatively straightforward project of modernisation. The term would then not be applicable for Nepal, because state irrigation development here has never been a straightforward project of modernisation (see above).

If the concept is to be applied for a study on Nepal, it is critical to differentiate between 'high-modernism', 'modernisation' and 'modernity'. As noted, high-modernism is defined as a particular conviction of experts in development, underlying a project of modernisation. The latter is usually a comprehensive package of technical and institutional measures aiming at widespread societal transformation and underpinned by neo-evolutionary theoretical narratives (Arce and Long, 1998). In contrast, modernity is used to grasp how ideas and practices associated with modernization and 'being modern' are themselves appropriated and re-embedded in locally-situated practices, producing a fragmentation and dispersal of modernity into various 'modernities' (see Arce and Long, 1998: 1-2; and also Ribeiro, 2009). As can be surmised, the terms are related, but only a conceptualization of the hydraulic mission 'as modernity' opens up the possibility to study state irrigation development as something dynamic; its convictions and projects being subject to change and contestations.

For clarification, the term bikas ('development') in Nepal has thus various meanings (Sharma, 2001; Tamang, 2002). So far I have mentioned it as an Turnerian experience that reflects and structures actions of people in Nepal, including those of professionals, giving meaning to the smaller and bigger things in life (see Chapter 1). By defining bikas as an experience, I mean that a (partially liminal) experience of 'being modern' in Nepal relies on various elements: (1) bikas as a conviction or state ideology (bikas as high-modernism); (2) bikas as state and foreign aid programmes (bikas as modernisation); and (3) bikas as appropriated meanings, embedded in the local context (bikas as modernity). Taken together, these dimensions can be seen to make bikas a partially liminal experience, rooted in social practice and its participants not being fully aware how it relates to specific (global) configurations of ideas and networks of knowledge. To illustrate, Sharma (2001) argues in his study on drinking water provision in remote localities in Nepal, 'that the provision of water by the state through foreign aid is as much about modernity as it is about improving the conditions of life among the poor' (p.239). He argues that this is true for government and aid agencies, as well as for local people (see p.241). In short, drinking water supply can be seen to constitute a liminal experience of modernity in Nepal, relying on high-modernist convictions and being shaped in modernisation programmes. If this is true, then it is presumably also true for state irrigation development.

To summarize, the hydraulic mission can be studied in Nepal as follows: The hydraulic mission is a high-modernist conviction that is 'reworked from within' by local actors, shaped in relation to 'real' state irrigation projects and linked to a historically mobile and hegemonic network of ideas, identities and knowledges. It can be seen as a located, self-referential experience in hydocracies and more broadly, also in the COP of the Irrigation Organisation and thus also in elite networks of 'our knowledges' in development, a conviction that its members might only be liminal aware of, recursively constitutive of everyday forms of state formation, and one that may occasionally translate in an 'emergent, and at times intentional, political strategy for controlling space, water and people' (Wester, 2008: 9).

The focus in Chapter 7 is not exclusively on the Irrigation Engineer and the COP of the Irrigation Organisation in Nepal. The hydraulic mission – in short the enduring conviction in

Nepal that the nation's future lies in irrigation and hydropower development – translates into an experience of modernity that is widely shared by experts in the government and foreign (aid) agencies as part of an experience of bikas. The topic of the hydraulic mission and how it relates to hegemony touches upon broader processes of national planning, state formation and development thinking. Thus, to understand the full implications of changing and intersecting, gendered thinking in irrigation expert knowledge, how it survives and is negotiated, it is required to understand how it links-up with the broader field of development knowledge.

7.3 An introduction to Chitwan District

This part of the chapter presents a background on Chitwan District and I explain why the district can be considered an exemplary case for a study on the hydraulic mission in Nepal.

7.3.1 General background

Chitwan is one of the 75 districts in Nepal and is located in the centre of the country (see Figure 7.1), about 150 kilometres southwest of the Kathmandu Valley, roughly covering an area of 2.218 km^2 (Regmi, 2007). Geographically, Chitwan is part of a strip of land that constitutes the interface between the Himalayan mountains and the Indo-Gangetic plain, bordering India in the South. This area is the Terai or *madesh*, and the alluvial valleys located in this plain are known as *duns*, also referred to as the Inner Terai or *bhitri madesh* (Guneratne, 2002). Chitwan is an Inner Terai district. Topographically, the district can be categorized in three zones – the Mahabharat range in the North (the foothills of the Himalaya up to 2000 meters), the Churia range in the South (gently sloping hills up to 600 meters that diverge from the Mahabharat range), and the duns at about 200 meters between the mountain ranges (see Annex 48 for a cross-section of ecological zones in the district). In total, 53% of the district consists of flat land and 47% of sloping land (DOI/CERD, 2007). The heart of Chitwan is the Rapti Dun, the largest of the two valleys in the district, named after the Rapti river that flows from east to west, and drains into the Narayani or Gandaki river. This big Himalayan river forms the border of the district in the West, and is a tributary of the Ganges in India (Müller-Böker, 1999). The names 'Chitwan' and 'Rapti Dun' are used interchangeably. The second dun in Chitwan, the valley of the Riu river is much smaller in size and remotely located (see Figure 7.2 below). Most government interventions and development activities in Chitwan have focussed on the Rapti Dun, and I have focussed my analysis in the district on this area.

Administratively, the district is divided into 36 VDCs, previously known as panchayats, and 2 municipalities (Bharatpur and Ratnanagar). The boundaries of the district were established in 1962, when Nepal was divided in 75 districts by law (Stiller and Yadav, 1978: 99-100)

Bharatpur is the district headquarters, situated in the west of the district.[55] A large part of the district is allocated for conservation areas, mainly for Chitwan National Park, which lies south of the Rapti river (see Figure 7.2). Another landmark is a protected forest corridor that connects the Hills and the national park, and divides the district in a relatively well-watered eastern and a relatively more drier western part. Chitwan has a sub-tropical climate, marked by the monsoon. It has an annual rainfall of 2000 mm, of which 75% falls in the wet season (Shukla *et al*., 1999). In these conditions, irrigation is a prerequisite to secure rice yields in the monsoon, and especially during the dry season.

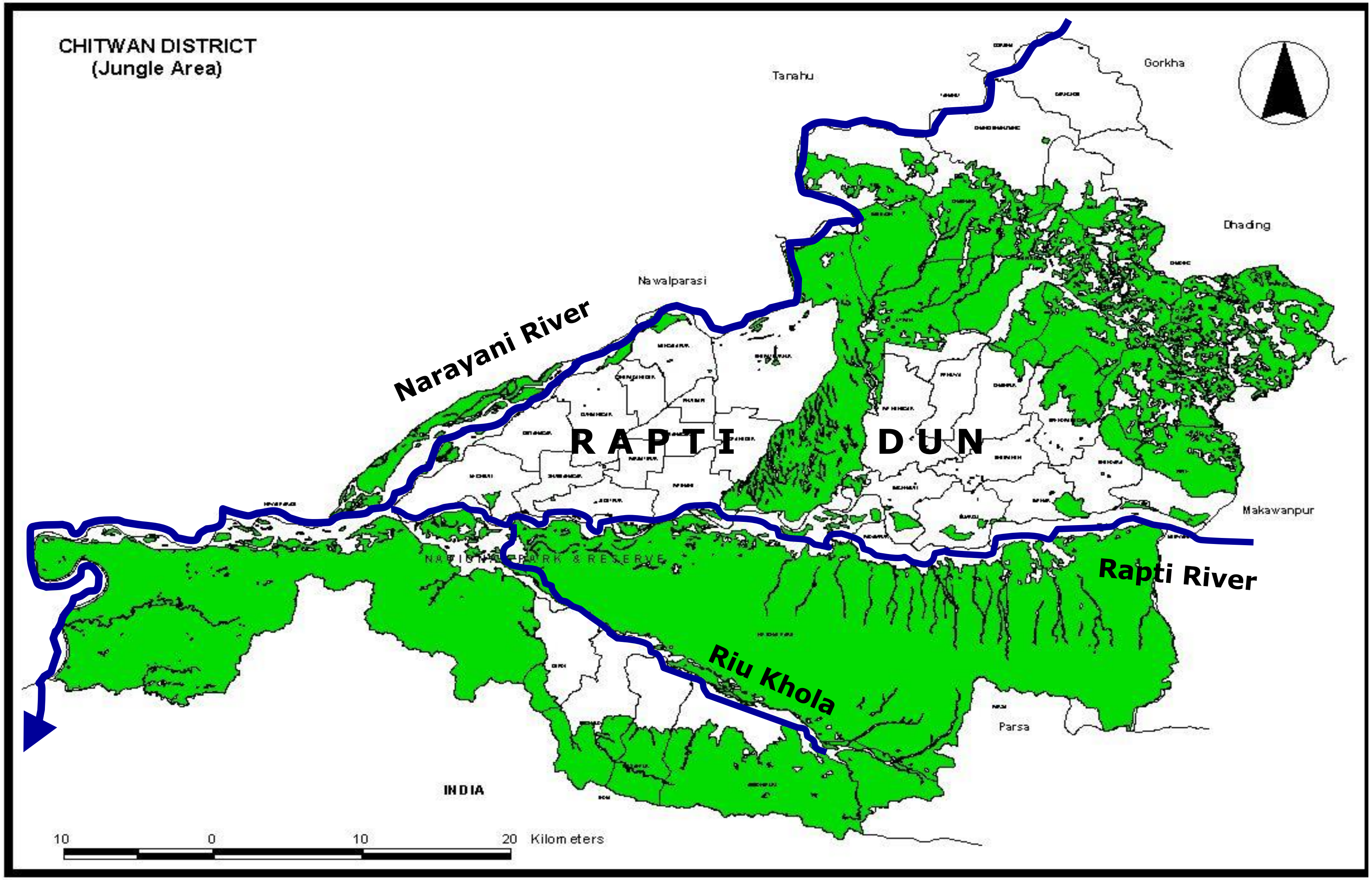
Chitwan can be considered the first Terai district that was targeted for modern development in the 1950s, starting with malaria-eradication and settlement programmes (Elder, 1975; Singh, 1984; Mathema, 1999). It has received a more than average allocation of public resources and professional expertise through a wide range of state interventions, from public works to agricultural development and nature conservation (USOM, 1958; Hagen, 1969; HMG-N, 1970b; Chapagain, 1972; Bolton, 1975). In addition, development in Chitwan has benefitted more than average from business and private sector initiatives in farming, trading, private health care and education, as well as in NGO activity (P.S. Pradhan, 1966; Kafle, 1995). The district has always been a frontier with opportunities, from acquiring land in the past to getting education or health care in the present, attracting migrants from all over Nepal (and India) who seek land and livelihood (Shrestha *et al*., 1993). Chitwan is known for its educated and politically conscious population (Kopila, 1993; Khanal, 2003), and foreign and national policy elites consider the district a model for Nepal (Guneratne, 1994: 93). It now has a dense road network, high coverage of drinking water and irrigation facilities, high number of hospitals and colleges, high literacy rates and increasingly less reliance on agriculture (CBS, 2001). The district's close proximity to the capital means that it is seen as a good place to test new interventions and policy models. It is thus also one of the most researched districts in Nepal – studies, assessments and academic writings on various topics are available and can relatively easily be found in Kathmandu-based offices, archives and libraries.

[55] Chitwan District is bordered by Makwanpur and Parsa districts in the east, Nawalparasi in the west, Tanahu, Gorkha and Dhading in the north, and the State of Bihar, India in the south.

Figure 7.1: Chitwan District in Nepal

Source: CBS, office in Chitwan District, 2001

Figure 7.2: Forest areas and main rivers in Chitwan District

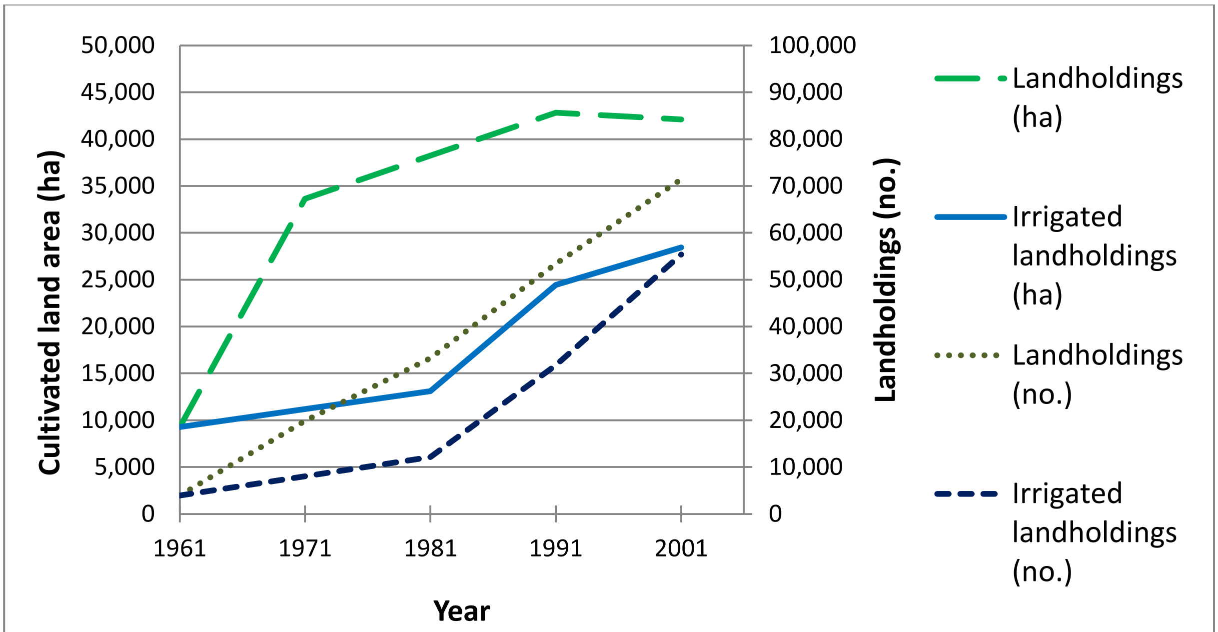


Source: CBS, office in Chitwan District, 2001 (I have added the rivers and the names to the map).

7.3.2 The closing of the land and water frontier

Like other Terai districts, Chitwan has undergone an enormous transition during the last 60 years, it changed from a sparsely settled jungle area to a densely populated economic hub of the country. The district attracted a massive influx of hill migrants after the malaria eradication programmes, particularly in the 1960s and 70s, and the population stands now at more than 600.000 people (CBS, 2001: projection for 2010). This implies that the population has grown 14-fold in the last six decades, compared to a growth factor of 2,5 on average in the adjoining hill districts (see Annex 49). Since the 1950s, the hill migrants, upon invitation of the government or on private initiative, took into possession 'new' land for cultivation. They also started to claim and use water for irrigation, either through projects of the state or by their own means (Khanal, 2003; Singh *et al.*, 2014). The massive influx of migrants and growth of population meant that the land and water frontier has closed rapidly (no additional cultivated land area has been recorded by CBS since 1990), resulting in the fragmentation of landholdings and more intensified use of water resources for irrigation (see Figure 7.3). By 2001, landholdings bigger than 5 ha were no longer recorded by CBS, and the average landholding stood at 0,60 ha in the district (CBS, 2001). Likewise, in regard to water use, by 2001, irrigation from 'old' water sources like ponds and tanks appeared no longer available, and farmers compensated the 'loss' of surface water resources by switching to the use of groundwater resources (CBS, 2001) – a trend that occurs throughout South Asia (Shah, 2008). These developments have produced (and continue to produce) a 'land and water squeeze' in Chitwan District (see Figure 7.3), forming a fertile ground for contestations and conflicts over the use of land and water resources.

Figure 7.3: The land and water squeeze in Chitwan District (1961-2001)



Source: CBS, 1961; 1971; 1981, 1991/92 and 2001/02. Agricultural census (see Annex 50).

7.3.3 An exemplary case of the hydraulic mission in Nepal

My choice to focus on Chitwan needs explanation because the district might not seem an obvious choice for a study on the hydraulic mission. As noted, the district is known for many things, but not necessarily for ‘successful’ projects in irrigation and water resources engineering. In literature and popular image, Chitwan is mainly associated with the Rapti Valley Development Project (RVDP), a state project in the 1950s to eradicate malaria and ‘open’ land for settlement, supported by the US and WHO (Guneratne, 1994; 2002). This RVDP was basically the first modernization project in Nepal and went into the history books as a success as far as the ‘battle’ against malaria was concerned. In Chitwan, 71% of the children had been infected with malaria in 1956, but by 1964, the area was free of the disease, and the DDT spraying method was replicated elsewhere in the Terai (Müller-Böker, 1999). This meant an improvement in the quality of life, both for the indigenous population and the hill migrants (e.g. less infant mortality, less illness, longer life span). The settlement effort of the project was less positively evaluated. Settlement of hill migrants did occur, but not in the orderly and planned fashion as the government and the Americans had envisioned (Mihaly, 2002 [1965]). By 1960, 27.759 hectares of land (66% of the presently cultivated land area in the district) had been distributed under 5.233 families, but much of it had been acquired by Kathmandu-based state elites (including members of the land distribution commission) rather than by peasants and landless people (Müller-Böker, 1999), and other land was settled by migrants on their own initiative, a practice that became known as ‘spontaneous’, ‘unplanned’ or ‘illegal’ settlement (Ohja, 1983; Singh, 1984; Mathema, 1999).

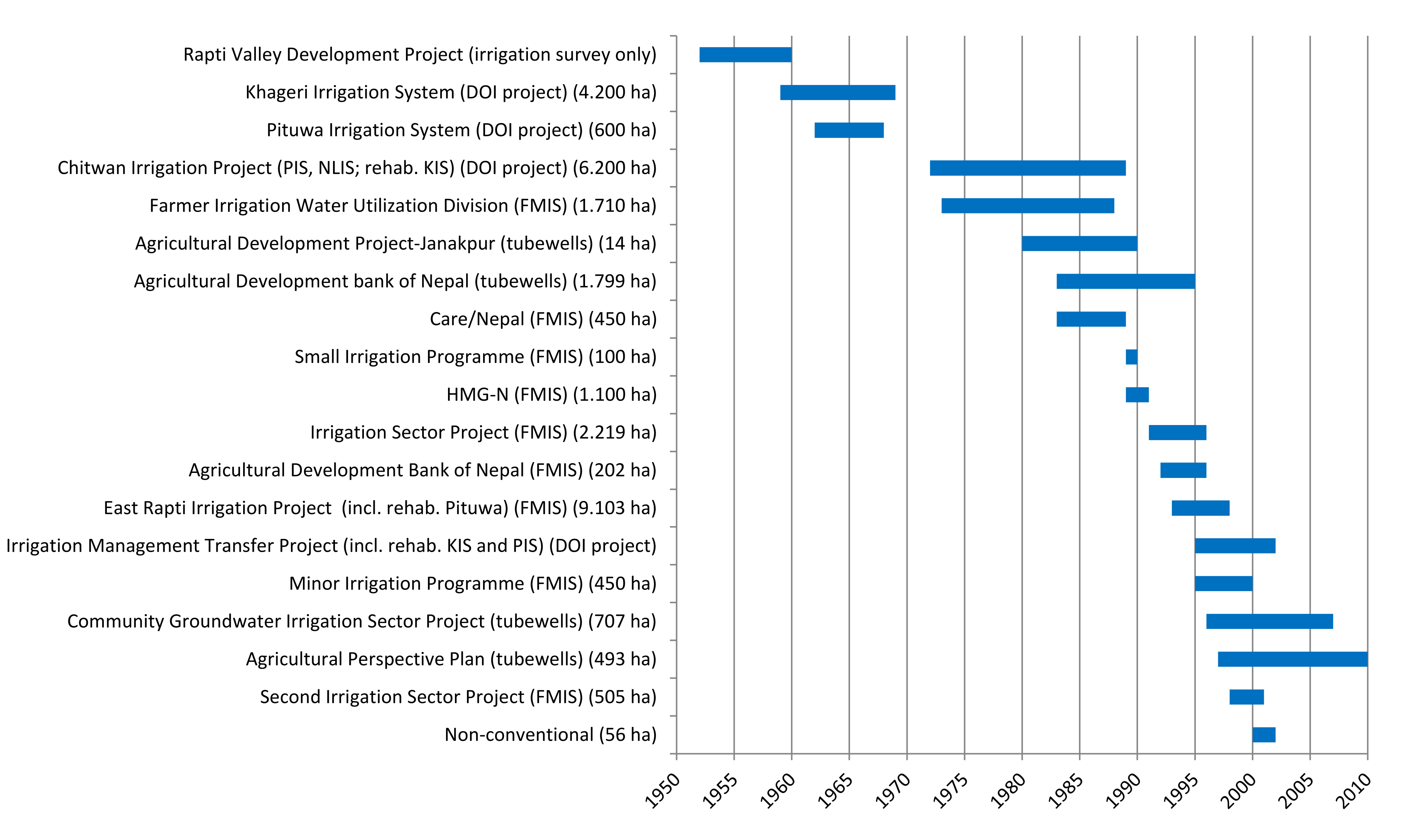
Second, development in Chitwan is mainly associated with the installation of Chitwan National Park in 1973 (Bolton, 1975). Illegal settlement and over-extraction of forest and wildlife resources, notably the poaching of rhinoceros and tigers, triggered state action in the 1960s to counter *sukumbasi* movements (landless people or squatter collectives occupying land), organise re-settlement and land clearings, and designate large areas for conservation (including hunting reserves for the royal house). For this purpose, the army was dispatched, authorized to use force (Müller-Böker, 1999). These measures earned Nepal praise of the international nature conservation lobby, notably the World Wildlife Fund (WWF), and the park was recognized by UNESCO in 1984 as a ‘World Heritage Natural Site’. The district became an important tourist attraction, featuring on most itineraries of foreign travellers, and today, the national park is one of Asia’s most important natural reserves. At the same time, Chitwan became exemplary in Asia for the failure of the American model for nature conservation, which envisioned parks as representatives of ‘the vignette of primitive America [read: Nepal]’, fencing off complete areas to protect them from ordinary use (Nepal and Weber, 1995: 853). The designation of large tracts of land as conservation areas, and the associated land clearings, caused bitter conflicts between the state and the indigenous Tharu population over the right to access forest lands, and the use of resources for fuel, housing, fishing, irrigation and livestock grazing (Guneratne, 1994; Nepal and Weber, 1995; Müller-Böker, 1999; McLean, 1999; Adhikari *et al*., 2009). In 1994, a buffer-zone was designated, involving local communities in the management of the area, making Chitwan once again a model for international conservation practice. However, the buffer-zone has only partially formed a solution for the conflicts and has been inadequate in addressing an experience of dispossession among the Tharu (Müller-Böker, 1999; Adhikari *et al*., 2009).

In these development images, Chitwan District has not (and does not) feature as a significant place of irrigation development. In the history of water resources development in Nepal, the attention usually goes to the big dam and canal projects that were constructed by India under the Kosi and Gandaki agreements in the Eastern and Central Terai (for instance, see the various historical accounts presented in Dhungel and Pun, 2009). Chitwan deserves, however, a prominent place in the irrigation development history of Nepal, because the district is exemplary for how the hydraulic mission has evolved here, starting from the 'failure' to build big hydraulic infrastructure in the 1950s and 60s to the implementation of 'smaller' projects in the 1970s, 80s and 90s and the enduring quest of engineers to capture available water resources as efficiently as possible for irrigation (and hydropower).

Another appealing reason to focus on Chitwan is that development in the district was originally conceived in the image of the Tennessee Valley Authority (TVA), the flagship model for multipurpose river development in the US at that time (Scott, 1998; Klingensmith, 2007). This history appears today largely forgotten in Nepal. Illustratively, the Rapti valley area was mentioned in a first water resources study of the UN on Nepal (UN, 1961), and the new government requested the FAO for technical assistance to construct a pilot irrigation scheme in Chitwan to test and introduce 'irrigation farming' in the country (UN, 1961). The pilot system that was built in the 1960s (Khageri) can be considered the first 'large' canal irrigation system, constructed under direct supervision of Nepalese engineers, making it essentially the first 'Nepalese' irrigation system in Nepal as others were built by Indian engineers. Since then, Chitwan has continuously benefitted from state irrigation projects (see Figure 7.4). This figure presents an overview, using the main categories in the irrigation statistics of the DBID database – 'DOI project', 'FMIS' and 'tubewells' (DOI/CERD, 2007). By 2010, 29.623 ha or 70% of the 42.132 ha cultivated area in Chitwan had been developed for irrigation according to the statistics of the DOI (see Annex 51 for the details), much more than the national average of 46% (see Chapter 6), and in a situation typical for Nepal, about 37% of the developed irrigated area was covered by DOI (canal) projects; 52% by rehabilitated FMIS systems; and 11% was supplied by tubewells.[56]

[56] As noted already in Chapter 6, a larger area may be under irrigation of shallow dug wells. In Annex 51, I have presented an estimate for Chitwan District.

Figure 7.4: Irrigation project development in Chitwan District (1950-2010)



Source: See Annex 51; KIS = Khageri Irrigation System; NLIS = Narayani Lift Irrigation System; PIS = Panchakanya Irrigation System.

7.4 Chitwan before the hydraulic mission (before 1950s)

In this part, I present a historical analysis on land and waters use practices in Chitwan before the 1950s. The existence of irrigation practices prior to the 1950s appears largely forgotten. It is not just a matter of having few written accounts and oral histories available. It also is a matter of hegemony and belief systems that once existed, having been replaced by a new bikas hegemony in the 1950s and 60s. With the establishment of a new hegemony, knowledge claims change and new representations and experiences of reality come into force. This realization is particularly relevant for a study on the hydraulic mission, because the temporal emphasis of high-modernism is mainly on the future, the past is considered an impediment and existing 'traditions' and human practices are seen as the product of 'backward' ideas, myth, superstition and religious prejudices – not worth documenting (Scott, 1998: 93-95).

7.4.1 The Terai, the Tharus and the court in Kathmandu

Chitwan and the Terai in general, has an old history (Regmi, 1999 [1972]; 1999 [1977]; Müller-Böker, 1999). The Terai, meaning 'wet land', is a vast alluvial plain at the foothill of the Himalayas that stretches across territory in India and Nepal. In the 1950s, this was a region of numerous streams and rivers, water-logged lands full of forests, reeds and tall grass with scattered patches of cultivation (Srivastava, 1999). The climate was extreme, damp and malarial, and the area was inaccessible during the rainy season. It was inhabited by a mixed population of Tharu and other ethnic people like Bhoksas in India and Darais in Nepal, Hindu castes and a few Muslims (Srivastava, 1999; Guneratne, 1999; 2002). The Tharu, however, constituted the most important group.[57] In 1950, according to government records of that time, approximately 40.000 people lived in the Rapti valley and up to 90% of the inhabitants were Tharu (Sharma and Malla, 1957; Guneratne, 1994; Müller-Böker, 1999). The origin of Tharu as a category arises from their occupation as herdsmen and cultivators of a particularly difficult ecological niche – the Terai; being a heterogeneous group of people and each group being localized in a particular area. The 'Chitawaniya' – those Tharus who live in Chitwan – constitute one of the major Tharu groups in Nepal (Guneratne, 1994: 53). Today, the Tharu are considered the indigenous inhabitants of the formerly malarial Terai jungle, a region in which other people were reluctant to settle. In this sense, the defining attribute of the Terai was malaria. Indian migrants and hill people feared it, they only visited Terai areas like Chitwan during the day and preferably only in the winter season. Tharus may have had a partial immunity to the disease, but they still suffered from it (Guneratne, 1994). For reasons explained below, malarial conditions in Chitwan were particularly severe and partially a human induced condition. Malaria is reliant on human carriers – without people no malaria –

[57] Other Terai groups in Chitwan are the Bote, Darai, Danuwar and Kumal. Tharu live exclusively in the Terai (in Nepal or India), while the others also live in valleys in the hills (Müller-Böker, 1999: 59).

and the agricultural (and irrigation management) activities of the Tharu themselves may have helped to perpetuate the incidence of malaria (Guneratne, 2002: 23).

The Terai region comprises just 15% of Nepal's total land area and it borders India for almost 900 kilometres. In 1950, however, the Nepalese state was not yet a physically contiguous territory, and the Terai – including Chitwan – was treated as a peripheral area that was only partially controlled by the court in Kathmandu (Krauskopff and Meyer, 2000). In relation to centres of power in India and Nepal, the Terai was essentially a frontier area. In the period from approximately 1500 to 1775, Chitwan belonged to various principalities whose rulers had their courts stationed in the hills, notably the kingdoms of Palpa, Tanahu and Makwanpur (Stiller, 1993 [1973]; Müller-Böker, 1999). In the period 1775-1777, under the successor of king Pritvhi Narayan Shah, Chitwan was assimilated by the Gorkhali rulers into the new centralized state of Nepal, but this did not bring immediate changes to the district. The rulers in Kathmandu were mainly interested in extracting revenue from the Terai for financing their wars and schemes of self-aggrandizement. The Gorkhali rulers preferred to annex territories above military conquest, demand loyalty of local authorities and leave existing tax arrangements in place with the subtle difference that revenue was now diverted to the court in Kathmandu (Regmi, 1999 [1972]; 1999 [1977]). This also happened in the case of Chitwan and the resultant administrative apparatus of revenue collectors in the Terai basically remained in place until the fall of the Ranas in 1951 (Krauskopff and Meyer, 2000).

Under the Hindu principalities of the sixteenth and seventeenth century, like those named above for Chitwan, and possibly earlier, conditions had been created in which customary forms of land control by communities came to fall under the principle of state ownership through royal charters (see also Chapter 1). After the Gorkhali conquest, land and other resources in Chitwan belonged *de jure* to the king of Nepal. In practice, however, control over land in the Terai remained *de facto* vested in local authorities, operating under three broad categories of land tenure; *birta*, *guthi* and *raikar* (Regmi, 1999 [1972]; 1999 [1977]). Birta was land granted to a high state official through a royal charter as payment for loyalty or compensation for services rendered. The grant was tax exempt and the birta owner was entitled to the revenue that otherwise accrued to the state. In the Terai, land was used to make extensive birta grants to relatives of the Ranas after their seizure of state power in 1846 (Guneratne, 1994), but in Chitwan, for reasons mentioned below, this did not happen.[58] Guthi tenure concerned relatively small land transfers to charitable, religious or philanthropic institutions and raikar was land from which the state derived revenue through the imposition of land tax. This category of land was most strictly administered by the state. Chitwan fell

[58] An elderly migrant farmer, who was politically well connected, reported that there were only two birta grants in Chitwan, made in 1924 and 1928, respectively of 30 and 40 bigha (field notes, March 2011).

almost completely under raikar tenure, forming the basis for a specific agrarian structure with implications for the use of land, forest and water resources.

At the time of the Gorkha conquest, the basic unit of land administration in the Terai was a *praganna*, an area that comprised a number of villages and was administered by a revenue agent called *chaudhari*. The chaudhari was usually a local landowner. Today many Tharu in Chitwan have or use the surname 'Chaudhari'. Following their accession to state power in 1846, the Ranas began to tighten control over the revenue collecting system and turned their attention to the Terai in 1861. The praganna system was considered inefficient and was replaced by a system in which the praganna was subdivided into a number of *mauja* (a village or group of villages), and each mauja was placed under charge of a *jimindar*, a functionary that was especially created for that purpose (Guneratne, 1994).[59] The word 'mauja' is still used by the Tharu to designate a village area. The jimindar, usually the biggest landowner in a village, became the local authority in the Terai, a chief responsible for the collection of revenue, functioning as a source of credit for farmers and exercising the power to assign fields for cultivation, call for corvée labour and settle conflicts (Krauskopff and Meyer, 2000). In Chitwan, jimindars continued to play a role in revenue collection up to the early 1970s, at least in East Chitwan, although the jimindari system itself was abolished by the Land Act of 1964 (Guneratne, 1994: 152). Jimindars were critical contact persons for getting the RVDP project started in the 1950s – they knew the way, organized elephant drivers, provided food and lodging to Nepalese state officials, and helped American technicians get around in the area. Today, the descendants of these jimindars still have an important status. They act as ritual specialists and comprise the core of the Tharu elite in Chitwan today (Guneratne, 1994, 2002).[60] They are seen as village leaders and they act as intermediaries for research and government interventions in areas where Tharu live, including for this study (see Figure 7.5).

The administrative reforms for revenue collection affected Chitwan, but the district was mainly treated as a backwater under Rana rule in contrast with Terai districts in the east which formed the mainstay of government revenue collection (Guneratne, 1994: 103). Generally, the Ranas encouraged settlement of Indian migrants in the Terai with the goal to secure or increase revenue, because labour was in short supply. In Chitwan, however, after the Anglo-Nepal war of 1814-1816, the Nepalese state followed a deliberate policy of de-population by moving a large part of the inhabitants out of the district into villages in the surrounding hills, and allowing much of the valley to revert to jungle (Oldfield, 1974 [1880]: 49, 140 cited in Guneratne, 1994: 104). This was a defensive policy. The route through Chitwan provided the quickest access to Kathmandu from the plains of India and the closing phases of the war had

[59] The jimindar of the Nepalese Terai (revenue collector) is different from the *zamindars* in India (landlords). In literature, this sometimes gets mixed up. Shivakoti *et al*., 1997: 150 refer to zamindars in Chitwan for instance.

[60] In Chitwan, the jimindars were Tharu. Elsewhere, they often were hill people (Bruins and Heijmans, 1993).

been fought in the valley. In fact, the breaching by the British of this important line of defence against invasion had made the Gorkhas feel compelled to accept the East India Company's terms for peace (see Gutneratne, 1994: 104). Chitwan appears to have been well settled then, but was thus turned deliberately into a malarial jungle by the state.

Figure 7.5: The masculinity of a Tharu leader and jimindar in Chitwan District

2011: Interview with a Tharu leader and jimindar, Mr. Chaudari (84 years old), in West Chitwan, 14-4-2011. A Tharu leader often has the status of a 'big man', acting as a mediator between the state and the community. He also is often a ritual specialist, acting as a mediator between the 'supernatural' and the 'real' world of the Tharu, keeping the local gods happy and pacifying the spirits of the ancestors and deceased persons (Müller-Böker, 1999: 74-76; cf. Krauskopff, 2000). Picture taken by the author.

Under the Rana administration, Chitwan was rated as a class C district, the least important category of districts in Nepal (other categories being A and B). Chitwan was originally divided in 5 pragannas (Guneratne, 1994; Shukla *et al.*, 1997). One of these pragannas was known as 'kalabanjar praganna', which can be translated as barren and forested lands (Krauskopff and Meyer, 2000: 35). This particular praganna was reported by a Tharu jimindar to have consisted of 22 villages and appears to have been the most sparsely settled area. In total, there were about 300 villages in Chitwan. Sharma and Malla (1957) reported the spraying of DDT in Chitwan in 282 villages (p.87). Guneratne (1994) estimated that only about 1700 hectares was under cultivation in 1955 (p.95) (about 5% of the presently cultivated area), but this can be considered a gross underestimation. The area that Tharus used for their sustenance was much larger. Sharma and Malla (1957) reported that about 10.000 *bigha* (6.800 ha) was used for farming and about 20.000 bigha (13.400 ha) for grazing (p.76), constituting in total 40% of the presently cultivated area. The Tharu rotated and left fields fallow for extended periods of time to restore soil fertility, they accessed large tracts of land for cattle-grazing, used waters for fishing and irrigation, and visited forests for products like reeds, wood, fruit and herbs (Sharma and Malla, 1957; Müller-Böker, 1999). One possible reason for the underestimation of the area used by the Tharu in Chitwan is that the jimindars had a strong incentive to report a lower area under cultivation than was actually the case, because they were personally held responsible by the state for recruiting settlers and the payment of a stipulated amount of tax in cash. The jimindar faced the risk of harvest failures and tax evasion of cultivators, although he was also in the position to accumulate the surplus of agricultural production. The Ranas sought to control the latter practice through 'revenue settlements' (sending in a survey team to re-assess the actual cultivated area and set new revenue targets), but these were few and far between. The last revenue settlement in Chitwan was in 1922 and the provisions of that settlement stayed in force for the next 40 years (Guneratne, 1994: 124). Illustratively, one senior Tharu recalled that the district was known as '16.000 Chitwan', indicating the amount of tax in rupees that was to be collected every year.

In practice, also after the revenue settlement of 1922, tax collection and agricultural production in Chitwan was treated as a minor concern by the state. Under the Ranas, Chitwan was monopolized as a private hunting reserve for the aristocracy. The Rapti valley was or rather had become 'the best shooting ground for the rhinoceros in the whole of the [Nepalese] dhuns' (Oldfield, 1974 [1880]: 49 cited in Guneratne, 1994: 106), and it was closely located to Kathmandu. This was probably one of the reasons why Chitwan remained a jungle area until the overthrow of the Ranas in 1951. Hunting was the major hobby for the Rana elite and an expedition to Chitwan or the forests of the Western Terai typically lasted 2 or 3 months (see Figure 7.6, 7.7 and 7.8). Game hunts consumed the labour of hundreds of people, who accompanied the hunting party as military escort, game scouts, trackers, beaters and camp followers (Gee, 1959; Bolton, 1975; Guneratne, 1994). The Ranas also used game hunts in Chitwan to maintain foreign relations and please British guests like the Prince of Wales in 1922. In Chitwan, the Ranas stayed in a royal lodge in Kasara (West Chitwan) or camped in Jhuwani (East Chitwan), and during their stay, they relied on Tharu jimindars for corvée labour, food provision, camp building, road clearing and other tasks that were deemed necessary. Illustratively, an old Tharu described the situation at that time as *rajako banchha*, 'the king's kitchen', meaning that the royalty could take in Chitwan whatever they wanted.

Figure 7.6: Performances of masculinity in the Terai in 1889-90

1889-90: Rana generals and high ranking officers on hunting expedition in the Terai (no specific place mentioned). This expedition was held at the occasion of the visit of His Royal Highness Albert Victor, Prince of Wales, to India and Nepal. These portrait photos were typical performances of masculinity and (male) grandeur of the royal classes at that time. Obtained from Madan Puraskar Pustakalaya (MPP library), Kathmandu. Photo code: EAP166_MPP_1889-90_047.

1889-90: Support staff of a hunting expedition near a local village in the Terai (no specific place is mentioned). The scene suggests that support staff prepare and take stock near a local village in the Terai. The homesteads in the picture resemble the architecture of Tharu homesteads in Chitwan. Obtained from Madan Puraskar Pustakalaya (MPP library), Kathmandu. Photo and archive code: EAP166_MPP_1889-90_075.

Figure 7.7: Performances of masculinity in Chitwan in 1921 and 1945

1921: Prince of Wales shooting his first tiger, Bikna Thori (near Chitwan). This party also visited Kasara, located in West Chitwan. The Prince of Wales shows in the middle; left from him (with beard) is Chandra Shamsher Rana, Prime Minister of Nepal. The prince was welcomed as the 'sporting prince' in Nepal during his trip to India and the Far East, and the photo portrays male vigour and strength in relation to the mighty tiger. Obtained from Madan Puraskar Pustakalaya (MPP library), Kathmandu. Photo code: EAP166_MPP_1921-22_131.

1945: British guests being hosted for a hunting expedition in Chitwan, presumably in West Chitwan, near Meghauli. Shooting was typically an activity for men, an opportunity to show their vigour and appetite for adventure and sports. This was no activity for (high-class) women. One British woman can be seen among the guests, sitting in the far right basket (behind the man who points to the field). Obtained from Madan Puraskar Pustakalaya (MPP library), Kathmandu. Photo code: EAP166_MPP_1945_009.

Figure 7.8: Performances of masculinity and state power in Chitwan in 1945

1945: British guests being hosted for a hunting expedition in Chitwan, presumably in West Chitwan, near Meghauli. A circle of elephants secure the scene and wait until the tiger breaks cover. In the Terai, the hegemony of Hindu kings in Kathmandu and the masculine performances of power that it entailed vis-à-vis the Tharu, was staged by the procession of the royal entourage on elephants. Elephants were a strong masculine symbol, being overpowered only be men, and riding an elephant conveyed status. Elephants functioned as important royal emblems, and processions on elephants were part of statecraft and served to stage kingship as a devotional practice. The big game hunts in Chitwan were an opportunity for the local people to receive royal blessings by ‘the sight’ of the king and his elephant (see Krauskopff, 2000: 44). Such royal expeditions were used by the state rulers to display power (and masculinities) and settle local problems in a grand manner. This practice also boosted the status of the nobility in Nepal vis-à-vis foreign guests, such as British royalties. While participating in game hunts, foreign guests could see with their own eyes the close connection between the symbolic and practical aspects of this power performance – riding elephants and mastering wild beasts go hand in hand with the dispensation of orders and favours (Krauskopff, 2004: 44). Obtained from Madan Puraskar Pustakalaya (MPP library), Kathmandu. Photo code: EAP166_MPP_1945_032.

Photos from this period in Chitwan are rare. Figure 7.6, 7.7 and 7.8 show a selection of pictures on hunting expeditions of the Ranas and their British guests, showing some of masculinities and 'positive self-identities' of the rulers at that time. They have been obtained from the Endangered Archive Programme of the Madan Puraskar Pustakalaya library, Kathmandu.

7.4.2 The irrigation skills of the Tharu

Most anthropological literature on the Tharu is silent about irrigation, while they did practice (and still practice) irrigation (McDonaugh, 1984; 1987; 1997; Guneratne, 1994; 2002; Müller-Böker, 1993; 1999; Skar, 1999; McLean, 1999; Krauskopff and Meyer, 2000). To illustrate, some of the larger and well performing FMIS systems in Nepal are located in the Terai, and are systems that were built by Tharu and managed with their knowledge (Howarth and Lal, 2002). The most famous Tharu scheme is perhaps Chattis Mauja ('36 villages') in the Western Terai, a system of 3.000 hectares, over 150 years old, and researched intensively in the 1980s and 90s by irrigation experts for defining policies of users' participation in irrigation (P. Pradhan, 1984; Rana, 1993; Neupane and Zwarteveen, 1996). Also in Chitwan, the Tharu were seasoned irrigators (see Shukla *et al.* 1993 and 1997; Shivakoti *et al*., 1997 for some excellent accounts of customary rights and conflict management in irrigation in Chitwan). One of the most researched systems in Chitwan, Panchakanya, was once a Tharu system, more than 200 years old, known as *raj kulo* (king's or big canal). This system originally served an area of approximately 100 hectares (Khanal, 2003; Singh *et al*., 2014).

The knowledge on irrigation and water regulation of the Tharu was integrated in their knowledge of the landscape and the organisation of agriculture, particularly rice cultivation, and that is presumably the reason why anthropologists do not mention the irrigation skills of the Tharu explicitly. The Tharu were farmers, cattle herders and fishermen. They also used forest products; hunting was not central to their way of life. The Tharu were known as 'pioneer cultivators' of the Terai; they could create rich farmland on the fringes of the forest, and the state elite saw Tharu peasants as a highly valued agricultural labour force (Krauskopff and Meyer, 2000). In many places, the Tharu transformed the landscape, from a forest into a 'jungle' in the Indian sense of the word; a land never completely mastered until the middle of the 20th century, but inhabited and used by humans (Krauskopff and Meyer, 2000: 39). Large tracts of land in Chitwan consisted of tall grass – not forests – an ecological condition that corresponded with Tharu practices of burning grass, reed cutting and grazing large herds of cattle (Müller-Böker, 1999: 115). The Tharu also transformed the landscape through the regulation of water flows. In the selection of land for agricultural and settlement, the Tharu balanced various criteria (e.g. access to water, floods, location of fishing grounds, grasslands and forest), but the single most important determinant was the availability of water and the possibility of irrigation (cf. Müller-Böker, 1999: 91; Krauskopff, 2000: 39). Hence, Tharu settlements in Chitwan are located near the Rapti and Riu rivers, in areas that allow for irrigation through the diversion of river flows (see Annex 52). These areas also are prone to floods, and the regulation of water flows through canals and make-shift dams required considerable organisational skill and knowledge of the landscape. The river morphology of shifting and silt-laden streams in Chitwan could 'leave' intakes in an inappropriate place, perpetuating the incidence of floods and being a source of conflict between villages.

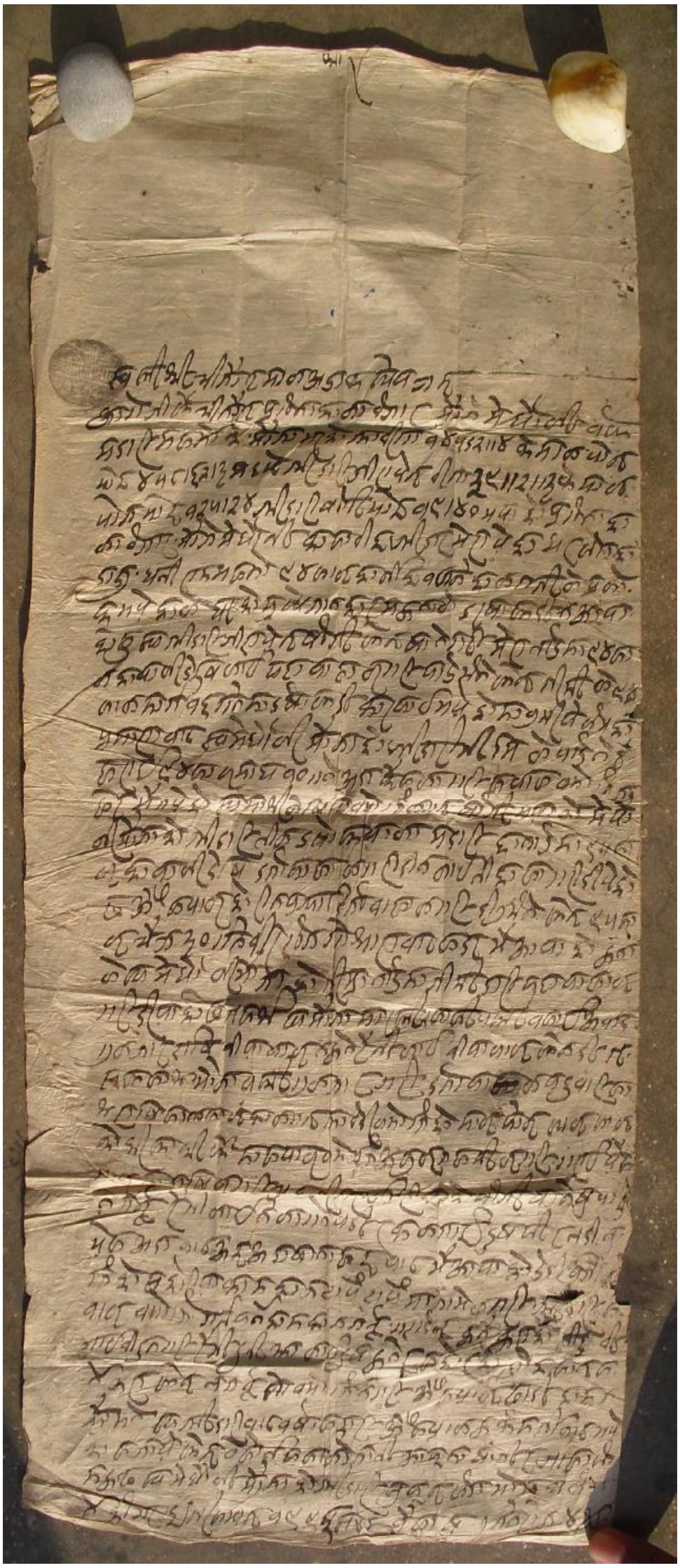
I found that experiences of floods, irrigation and water regulation are integrated into legends and 'technotales' of the Tharu – folk stories about work and technology (Reuss, 2008: 539). The most appealing technotale is about Dhungre *khola* in East Chitwan ('khola' means river in Nepali). Today, the Dhungre khola is the source of more than 10 irrigation systems in the area, flowing through the heartland of the Tharu in the district. According to the legend, Dhungre khola was first Dhungre *kulo* ('bamboo canal'), constructed by a jimindar to make sure that his son could marry the handsome daughter of another jimindar, with whom he had fallen in love. She initially had refused to marry him, because she insisted to eat rice in her life rather than maize – rice is considered tastier and a ritually significant food in Hindu culture and requires access to wet lands or irrigation. The jimindar left no stone unturned. He ordered to dig a canal from Lothar khola (now the eastern border of Chitwan District) to irrigate his land for rice cultivation, and connected thick bamboo rods into a pipeline to prevent leakages. 'His' project was a success, the land was irrigated, rice cultivation assured and his son could marry the beautiful daughter. In the years thereafter, the story tells, the kulo was destroyed by a flood and became a khola, and the jimindar had to secure new irrigation sources. In total, I have been told three variations of this story and similar accounts are mentioned in literature (see Sharma and Malla, 1957: 70 and Shukla *et al*., 1993: 31), but the core message is the same. The tale illustrates (and transfers knowledge about) the risks and benefits of rice cultivation and irrigation in flood prone areas. The tale also suggests that water regulation activities of Tharu – digging canals, building dams and diverting river flows – transformed the landscape radically. Dunghre khola is now seen as a 'natural river', used by hotel and tour operators in Chitwan to organise 'wild life canoe trips' for foreign tourists.

As noted, irrigation and water regulation was integrated in the agricultural organisation of the Tharu. In the capacity of the revenue collector and state agent, the jimindar also was the authority to decide on water use and he was expected to approve and organize irrigation works. His authority was vested in rights that were granted to him by the state, usually through written instructions of the local revenue office. Locally, these instructions were known as a *jimindar patta* ('paper of the jimindar'), a document that confirmed the position of the jimindar and specified the conditions that were to be followed. Figure 7.9 presents such a rare document, sent from the revenue office in Birgunj to the revenue office in Chitwan, confirming the death of a jimindar in Meghauli, a village in West Chitwan, and the transfer of the rights to his brother, Mr. Madari Mahato.[61] The instructions do not specifically mention duties for irrigation works. They only stipulate the obligation to pay revenue for the mauja, treat the *raiti* (landholding peasant subject to taxation) fairly and stick to government rules and regulations. However, such responsibilities can be considered to have fallen under the need 'to keep [the] raiti happy and satisfied' (condition no. 2). In other words, without irrigation facilities to secure the rice harvest and protect the area from flooding, raiti had an incentive to move somewhere else, to the Terai in India for instance. In this regard, it is no surprise that elderly Tharu claimed that every village in Chitwan had access to water for irrigation. This would imply that Chitwan had an estimated, maximum number of 300 irrigation schemes around 1950. This claim is partially confirmed by an inventory study on community schemes in East Chitwan in the 1980s, which mentioned about 35 schemes in 1950 for that specific area (DOI/Nippon Koei/SILT, 1990). Extrapolating this number for the total area in Chitwan in 1950, it produces an estimate of about 80 to 100 irrigation schemes.

The interpretation of the jimindar patta as implicit instructions of the state to develop irrigation works and 'keep the raiti happy', explains why jimindars in Chitwan were not hesitant to bring conflicts over water between maujas to the Ranas for resolution (cf. Krauskopff, 2000: 44). The ultimate authority in Chitwan was the king and his court, also in relation to water affairs. A senior member of a jimindar family in East Chitwan, for instance, recalled in an interview how the digging of a canal for one mauja over the land of another mauja had triggered a rivalry between cultivators, evolving into a conflict which the jimindars were unable to solve (as I understood, he referred to events in the 1940s, perhaps 1946). Eventually, the issue was presented to the Ranas, holding camp in Jhuwani for one of their hunting campaigns. Supposedly, both sides got an opportunity to make their case and a decision was made, dividing the waters between the two maujas. The judgement of the Ranas was a decision that was then to be respected and enforced. These events appear to have been the exception rather than the rule, but they illustrate the authority of the state and the position of the jimindars in relation to water affairs at that time (Shivakoti *et al*. 1997: 146-159 give details of the involvement of jimindars in irrigation conflict resolution, going back to 1922).

[61] I have presented the jimindar patta integrally in the text, because these documents are rare, i.e. the identification of the recipient and the local context attached to these otherwise very administrative documents is rare and valuable (Krauskopff and Meyer, 2000: 25). This document can be considered a second order document. See Krauksopff and Meyer (2000) for first order documents or direct royal orders, sent to Tharu recipients and dealing with political issues. This document concerns economic and agrarian matters, and was sent by officials lower in the hierarchy (many of these documents were issued, but these are very difficult to trace).

Figure 7.9: Jimindar patta (1937)



‘*To: Chitwan Revenue Office,*

(...).

On 10th Magh 1994 BS [± 1937 AD], *the Revenue office* [in Birgunj] *decided to provide jimindari position to Madari Mahato (...).*

Few of the conditions to be followed by Madari Mahato:

1. *He has to pay revenue from 1995 BS* [± 1938 AD] *onwards.*
2. *Need to keep raiti happy and satisfied.*
3. *Pay revenue timely (...).*
4. *Not to put high tax in the mauja.*
5. *Not to ill-treat raitis.*
6. *Need to help the government with annual official works.*
7. *Need to reside/ follow government rules and norms.*
8. *Government will not entertain information regarding losses (...).*

If he (...) follows the conditions, his jimindari is assured. If not, he will be expelled or disqualified as jimindar plus he will be sentenced to other charges’.

Obtained from Mr. Chaudhari, member of a jimindar family, West Chitwan, 2011 (see Annex 53 for full translation).

Figure 7.10: Irrigation systems and structures of masculinity in Tharu areas in Chitwan

2011: The organisation of irrigation – and the clearing of land for irrigated agriculture – was connected to performances of masculinity among the Tharu, particularly of the jimindar. Krauskopff (2000) describes the Tharu world order in the 19th century as a society of 'big man' and argues that there was a congruence between sacred and political power (p.41). The religious and political sway of a 'big man' – a chaudhari or jimindar – was based on the authority inscribed in a royal land grant but also defined by the talent of the big man, sealed by local gods, to pacify the land's invisible dangers, and promote its prosperity. *....to be continued on the next page*

...continued from the previous page
'His' capacity to master invisible dangers and safeguard prosperity, made him a legitimate headman in the eyes of his followers, particularly when the time of new clearings in the wilderness had come – the big man as the 'creator' of new land. Also dam and canal construction for irrigation had strong ritual significance, it was considered suitable for men only and was treated as an activity that had to be mediated by the jimindar in order to please the gods. It is not difficult to image the masculine connotations of manipulating water flows for irrigation and the role of big man in this in Tharu society. In 2011, one senior Tharu in Chitwan explained to me that a *puja* is required at the site of the dam, in advance of construction works, to please the gods, and I was told that women are still not supposed to participate in dam building. This account resonates with anthropological work on irrigation and masculinities in community irrigation systems elsewhere (see Sheridan, 2002 for an account of Tanzania on 'an irrigation intake is like a uterus'). Pictures taken by the author.

Irrigation and water regulation required a great deal of organisation and technical skills for which the Tharu had a specific terminology (see Shukla *et al*., 1993: 24-25 for a detailed list of terms). The Tharu in Chitwan had (and have) a vocabulary for flooded and humid areas, and also use a detailed soil classification based on crops, access to water and irrigation (Sharma and Malla, 1957). For instance, the Tharu word for 'rice land with controlled irrigation' is *dabar* (see Müller-Böker, 1999: 96-99). The organisation for irrigation works fell under the responsibility of the jimindar, assisted by his *cautariya* (the first raiti in the mauja, see Guneratne, 1994: 132), who functioned as a secretary of the jimindar, monitoring the labour contributions of the *baharia* (servants) and raiti for dam construction and canal digging.[62] The jimindar also appointed a *samhaniya* (menial assistant, see Guneratne, 1994: 141), who acted as a messenger and was responsible for keeping flood watch and mobilizing labour instantly in emergency situations. The cautariya used a *lathi* or *laggi*, a stick to measure earth work for assigning and monitoring labour contributions (*banihari* or *banwari*) for irrigation works, (P. Pradhan, 1989; Shukla *et al*., 1993; Guneratne, 1994).[63]

The construction and maintenance of diversion structures and canals – usually undertaken shortly before the onset of the monsoon – was a delicate matter; one flood could destroy all infrastructure in a matter of hours. Diversion dams were typically positioned diagonally in the river and built with a long crest, known as a long-crested weir in engineering knowledge, allowing the weir to pass a much higher flood than from the available width of a natural water

[62] Shivakoti *et al*., 1997: 150 describe that the responsibility for irrigation fell under the chaudhari praganna, but the praganna system was replaced in the late 19th century with maujas (see main text).

[63] Guneratne (1994) describes 'banihari' as 'agricultural wage labour' – not as unpaid labour – but Shukla *et al*. (1993) describe 'banwari' as 'labour resource mobilization at the time of repair and maintenance of diversion structure[s]' (p.24). In interviews with a senior Tharu jimindar (and previous chairman of a WUA), the term banwari was described to me as documented by Shukla *et al*. (1993).

course (Ghare, 2008) (see Figure 7.10). Diversion structures were also constructed with a gentle slope at the head-end, covered by clods of roots, sods of grass and branches positioned in the direction of the water flow. The top crest often consisted of rectangular positioned stones, branches or banana tree trunks that would drop or snap, or could be removed by hand when the water pressure became too high, instantly reducing the height of the diversion structure and allowing a larger water flow to pass the weir, thus saving both weir and canal infrastructure from destruction. The actual intake of the canal was located at the fringes of the riverbed and required the annual digging of a feeder canal from weir to canal intake. This was a laborious task, but protected the canal from floods (the diversion structure and feeder canal were often washed away, but the canal remained intact). The construction of canals was an equally delicate matter. Canals required a gentle slope to prevent erosion, had thus to follow contour lines of an area precisely – an arduous task in an alluvial landscape – and were built with considerable width to reduce the water velocity (see Figure 7.10).

Many Tharu systems provided for perennial irrigation, meaning that these systems supplied part of the command area for a second or even third season, in addition to the monsoon (Shukla *et al*., 1993). Today, Tharu practices in relation to irrigation have survived in Chitwan. Most systems now have received 'rehabilitation' support of the state, but it often happens that concrete structures are washed away, leaving farmers to rely on what can be considered Tharu knowledge of the construction of diversion structures and feeder canals. In the traditional Tharu areas, it often is the descendants of the jimindar who occupy key positions in the WUA of the systems and as noted, the Tharu skills for organisation and labour mobilization are still considered exemplary for 'collective action' among farmers in FMIS systems in Nepal (pers. comm. Dr. Prachanda Pradhan, 20-01-2011).

7.5 The development of the hydraulic mission in Nepal (1946-1970)

This part of the chapter analyses how the high-modernist conviction of the hydraulic mission came to Nepal and has been 'reworked from within' by local actors (Arce and Long, 1998: 2). The introduction and development of this conviction was negotiated gradually in Nepal, being moulded from a set of foreign ideas on 'water planning' in the 1940s to a well-articulated and high-modernist statement of 'year-round irrigation' in the earlier mentioned first master plan in Nepal on irrigation development (HMG-N, 1970b). There are good historical accounts available on early water resources development (Dhungel, 2009 presents a detailed account for instance). Here, the focus is on tracing the origins of these ideas and exposing some of the contested views then prevailing among planners, engineers and foreign experts in Nepal. The purpose is to explore the idea that the development of the hydraulic mission in Nepal has been a process of negotiation, involving talks that were rarely only about technicalities and the location of administrative authority, but also about customs, values and traditions, competing visions of the past and the future, *and about masculinities* (emphasis is my contribution)

(Reuss, 2008). Indian ideas on 'irrigation works', and especially the TVA idea of 'water planning' embodied a grand claim of authority, bestowing extraordinary powers on a new class of professionals, shaping the masculinities of planners and engineers in the process. As Mihaly (2002 [1965]) writes for the 1950s and 60s, particularly in relation to foreign agents in Nepal, 'they knew – they just knew – what had to be done' (p.x).

7.5.1 Foreign ideas on water works and water planning being introduced in Nepal

The first ideas and plans on 'water works' that concerned rivers and water territories in Nepal originated from the British in India. Four of these ideas are worth highlighting here; those for the Kosi and Trijuga rivers in East Nepal, the Mahakali (or Sarada) river on the border in West Nepal, and the first hydropower plant of Nepal at Pharping in the Kathmandu Valley (Regmi, 2004; Adhikari, 2006; Dhungel, 2009). Generally, the British initiated public works and departments for irrigation in India from the perspective of colonial administration – to maintain law and order, collect revenue and enable settlement with some secure livelihood (Staples, 1992). In this regard, the construction of 'irrigation works' served mainly to expand the colony, treated by the British as targeted attempts to secure revenue and strengthen state power – not as part of a philosophy of 'development' and 'planning'. In this context, the ideas on public works that the British introduced in Nepal were related to territorial objectives in India or part of a (foreign) policy of the British to secure political support of the Ranas. Likewise, the Ranas cooperated with the British from a foreign policy perspective, for their own benefit and to protect their interests and keep the British 'out' of Nepal.

The first idea brought to Nepal concerned the Kosi river and was about 'flood control'. In the British days, the Kosi was known as the 'sorrow of Bihar', a river that caused damage to lands in Bihar due to floods and shifting river beds. In 1893, the British considered the building of embankments to fix the course of the river. They also requested permission to the Ranas for constructing a barrage on the Kosi river at the point where the river left the Hills and flowed into the Nepalese Terai. This request was accepted by the Ranas in 1897 on the condition that no lands and temples would be damaged. However, for reasons unknown, the barrage and embankments were not built at that time but the idea of 'flood control' was introduced in Nepal (see Dhungel, 2009: 13-15 for a detailed account). The second idea was 'hydropower technology'. In a strategic move by the British to gain political support, the British introduced the Ranas to hydropower for 'lighting the palaces' with electricity (Regmi, 2004: 64). In this context, between 1907 and 1911, the first hydropower plant – the second in South Asia – was constructed at Pharping in the Kathmandu Valley with British aid (Adhikari, 2006).

The other two proposals on water works related to irrigation and canal construction. In 1910, the British were granted permission by the Ranas for a survey of the 'Sarada canal', a project that would take water from the Mahakali river on the border in West Nepal. In this area, waters were primarily used for irrigation in India, but the project appears to have inspired the Ranas to secure a provision from the British in 1920, in negotiations on the construction of head works, to provide a 'quantum of water' for irrigation in Nepal (Dhungel, 2009: 13). This provision can be considered the first 'water treaty' between Nepal and India. The British completed the Sarada barrage in 1928, but it was only in 1998 that Nepal came to use its allocated share of water with the completion of the Mahakali Irrigation System (11.600 ha). Elsewhere, in the Eastern Terai, the Ranas did succeed in fulfilling their aspirations for irrigation. In 1922, the Ranas sanctioned the construction of the then state-of-the-art 'Chandra Canal', built with an intake in the Trijuga River (a tributary of the Kosi river). For this project, the Ranas requested the services of a British engineer who was on deputation with the Irrigation Department of the United Provinces (now Uttar Pradesh) (Dhungel, 2009). The Chandra Canal was the first state-built irrigation system in Nepal and it marked the start of a few more public water works in Nepal in the 1930s and 40s (Shukla and Sharma, 1997).

As can be distilled from this account, between 1900-1940, when the British Indian (irrigation) engineering tradition was introduced in Nepal, the Ranas relied on British and Indian engineers for the execution of water works. There were, however, also some engineers on the Nepalese side. One of these men was engineer-colonel Kishwor Narsing Rana (see also Chapter 3). He acted as the 'executive engineer' in the construction of the hydropower plant at Pharping (1907-1911), was one of the officials in the negotiations with the British on the Mahakali river (1916-1920), and played a role in the construction of the Chandra Canal (starting in 1923) (Adhikari, 2006; Dhungel, 2009). His title of 'engineer colonel' illustrates that Nepal had adopted from India the close connection between engineering and the army (Zwarteveen, 2011). As in India, the implementation of water works was considered of strategic importance by the Ranas. His involvement also illustrates that civil engineers in Nepal, as in India, would become the principal actors in development projects and water resources development. In the 1940s and 50s, it was the Indian engineering colleges that produced the first Nepalese engineers for public service, among them the Irrigation Man and the Water Emperor, and the Canal Department in Nepal was set up in 1952 by a retired Indian irrigation engineer from the Punjab, Kartar Singh Garcha (see also Chapter 3).

In the 1940s, new ideas on 'development' and 'planning' were introduced in Nepal, and with it new professional fields like agriculture, rural extension, economy and planning. Most of these ideas and professional fields are nowadays associated with the fall of the Rana regime in 1951 and with the start of planned development in 1956, but that is not entirely correct. The idea of modern planning, including the idea of 'water resources development', was introduced into Nepal a decade earlier (Stiller and Yadav, 1978). The 1940s was a turbulent decade. The world was at war (Nepal supplied soldiers through the Indian army) and in 1947, India gained independence and embarked on a path of Soviet style centralized economic planning under leadership of the 'socialist' Nehru (Staples, 1992). After independence, India developed strong interests in public works in the Terai, also putting pressure onto Nepal (Dhungel and Pun, 2009). At the same time, as a result of the war, the US had emerged as the leader for 'world reconstruction' and it started to promote an American liberal internationalism that promised progress and democracy in the 'new nations' of the world (Klingensmith, 2007). In the postcolonial context, India and Nepal were perceived as such 'new nations'. India especially became an immediate concern for the US, a place where peace, democracy and independence had to be won against expanding Soviet influence, and the Americans started to assist India in the late 1940s with development and transfer of technology (Staples, 1992; Klingensmith, 2007). These events did not leave Nepal undisturbed. Indian nationalism and new ideas of national progress and democracy weakened the position of the Ranas. It inspired Nepalese nationalism and half-heartedly, the Ranas initiated the first 'field studies' in Nepal, inviting foreign experts to assist in planning, not just British and Indian engineers, but also a British forester and a Swiss geologist (Gee, 1959; Hagen, 1969; Stiller and Yadav, 1978).

The chief item of US technical assistance, in what has been called the 'exportable New Deal', was the TVA (Klingensmith, 2007: 6). In the late 1940s, the TVA enjoyed broad public recognition, not only in the US but also in the nations that had allied with the US in the Second World War, among them India and Nepal. The TVA was regarded by the West as a paradigm for world reconstruction, a model agency which showed how 'the liberal state' could meet or avert the political and social challenges of economic crisis (see Klingensmith, 2007 for an analysis on TVA representations in India). For the US, the 'TVA idea' was about the technical, apolitical and bureaucratized management of natural and economic resources, a model of planning that would produce prosperity for all in a way that could be reconciled with real, grassroots, democratic participation – a view eloquently expressed by 'Mr. TVA', David Lilienthal, in his book 'TVA: Democracy on the march' (1953). Internationally, the TVA led the way in 'water planning' and 'multipurpose river basin development', and it inspired dozens of 'river valley projects' in Asia, including in India and Nepal (see below). Generally, the TVA was representative of its method rather than its technology (Lilienthal, 1953: 214), meaning that it did not necessarily bring new technology to Asia but introduced a framework for re-imagining the purpose of existing technology, and the way how water works should be implemented as part of 'water resources development' and 'total control of watersheds'.

For India and Nepal, however, the 'TVA idea' (also) represented something else. Certainly, the TVA was understood as a new way to control a river system and a watershed as a unit area for development, exploiting every opportunity in a way that resources are not used up too fast, (Lilienthal, 1953: 214), but development, modelled after the TVA, was also seen as an opportunity to modernise the country and to introduce and progress its people to modernity.

The 'TVA idea' was strongly associated with nation-building and nationalism, much less with building liberal democracy or alignment with the West, and many of the dams and water works it inspired came to be seen as symbols of national strength and virility. In India, for instance, a central element in the state's post-independence economic planning was the development of the nation's river valleys to provide power for its factories and irrigation water for its fields. In fact, in the mid-1950s, dams were considered so important that Nehru famously spoke of them as the 'temples' of a new, progressive India (Klingensmith, 2007). In this regard, the TVA was largely symbolic as Lilienthal (1953) noted himself, the term 'TVA' was loosely applied in a diverse range of projects and proposals, and it happened, for instance, that big dams were called a 'TVA' because there also were dams in the Tennessee valley (p.214). In fact, the 'TVA idea' could only work in India and Nepal *as a symbol*, because the Tennessee valley differed fundamentally from most river valleys in South Asia, and planners and engineers had to come up with different approaches. For instance, in Nepal and India, in the 1950s, the pressure of population on land and water resources was much higher than in the Tennessee valley (in the range of 7 times higher), and the Tennessee valley was a region with abundant rainfall, not requiring the use of stored water for irrigation (Lilienthal, 1953: 215). In contrast, the 'TVA-projects' in India placed heavy emphasis on the storage of water for irrigation and the promotion of modern agriculture.

In Nepal, the 'TVA idea' was introduced in the mid-1940s by Indian engineers, as well as by Nepalese planners who visited the TVA in the US (Pandey, 1988). Two projects are important here, the 'Kosi dam project' and the RVDP in Chitwan. These projects can be considered the first attempts in Nepal to implement a unified, watershed-based, multipurpose development approach for total control of land and water resources. The first proposals for the Kosi dam project on 'multiple-purpose flood control' originate from India, and were discussed among Indian experts at the Patna flood conference in 1937. Their proposals concerned the flooding of the Kosi river in Bihar and the related damages (see above). This time, however, their plans went further than a barrage, they envisioned the construction of a big dam in the mountainous area of Nepal (Prasad, 2009: 516-518). Their idea, like for other river valley projects in India, was the total control of the watershed for flood and erosion management (GOI, 1946; Balwant, 1950; Shori and Mansharamani, 1957). Following this proposal, the Ranas, in cooperation with the British Indian government, allowed Indian engineers in 1946 to start investigations on the watershed of the Kosi river for a multiple-purpose river scheme, envisioning the construction of a 783 foot high dam (about 238 meters) (Prasad, 2009). Eventually, the plan turned out as too expensive for India, but the cooperation between the Ranas and the British Indian government at first and then the government of India did produce the Kosi Treaty in 1954 (Dhungel, 2009; Prasad, 2009). In the treaty, the plan was scaled down to the construction of a 'modest' diversion dam for flood and silt control. This dam – the Kosi barrage – was eventually constructed by Indian engineers between 1959 and

1963 at Bhimnagar, located about 15 kilometres from the Himalayan foothills, in an area that straddles the Indo-Nepal border. Today the image remains that Nepalese public officials and engineers had no significant role in the Kosi project and the treaty (Dhungel, 2009; see also Stiller and Yadav, 1978: 68-70 for an account of the making of the treaty). This was a different story for the other initiative, the RVDP in Chitwan District.

7.5.2 A 'TVA in Nepal' in the Rapti valley[64]

The RVDP can be said to have started in 1946 with *sardar* Bhim Bahadur Pandey.[65] He was one of the first modern planners of Nepal (see Figure 7.11). He was involved in conceptualizing some new development activities during the tail-end of Rana rule and later, in the 1950s, he became the secretary of Planning and Development (Pandey, 1988). He travelled to India, England and the US, learned about the Indian planning system of national budgets and five-year development plans, and was sent by the Ranas in December 1946 to America, as the first secretary of the Nepalese embassy in London, to study and observe the TVA. Interestingly, Pandey (1988) mentioned in his book *Tyas Bakhatko Nepal* ('Nepal at that time') that Nepalese officials had visited the US before, but that his visit was specifically meant to study the TVA because it was considered an international model for an undeveloped region like Nepal, to learn about all aspects of development (volume 4, p.6). Having seen the TVA, he felt that something similar could be done in Nepal and in 1948, he identified Chitwan – an area in which earlier settlement camps had failed – as a place to 'retry' development, this time conceived in the image of the TVA (Dahal, 1997; Shrestha, 2009 [1998]).[66]

Much like Nehru, and planners and engineers in India, Pandey and other members of the elite in Nepal aspired for national progress through planned development with the goal to 'catch up' with the West and they saw in the TVA a promising way to achieve that. More specifically, the TVA, and the associated ideas of 'multipurpose development' and 'resources management planning' provided an image for Nepalese planners and engineers to table their aspirations for more irrigation and hydropower projects, and for extensive land settlement in the Terai, in a way that it was appreciated by Western experts and foreign aid agencies. As described, American and other Western agents in the region were mainly concerned with

[64] I feel compelled to describe the course of events in considerable detail here because the TVA history of the RVDP, and with it the TVA history of Nepal in general, is not well documented. The effect is that the RVDP has lost its meaning in the history of water resources development in Nepal. The analysis in this section relies heavily on conversations with Dr. Tom Robertson, Worcester Polytechnic Institute, Massachusetts, and a public presentation of his, held at Martin Chautari, Kathmandu, 3-8-2011.

[65] Sardar was a honorary title of a high administrator under the Ranas.

[66] B.B. Pandey is said to have flown over Chitwan in 1948 on his way to Delhi when there was a food crisis in Kathmandu, and saw Chitwan out of the window of the plane (Dr. Tom Robertson, public presentation, Martin Chautari, Kathmandu, 3-8-2011).

building-up grassroots democracy to create ‘new nations’ free of communist influence, and they hoped to achieve this through technical assistance and rapid economic development (USOM, 1958). In this context, reflecting the strength of the TVA image, ideas on water regulation for electricity and irrigation supply were discussed hand in hand with ideas on political reform. For instance, in June 1946, on their way to Britain and the US, a Nepalese delegation, including Pandey, spoke about 40 minutes in Delhi, with Lord Pethick-Lawrence, the British secretary of state for India and Burma, about the political structure and the development of the economy in Nepal. Pethick-Lawrence urged the Rana delegation to ‘understand’ the ‘mass movement’ in Nepal, comparing it with flowing water. He compared ‘control’ (read: excessive control) of the mass movement with the ‘bursting of a dam’, creating damage to the country and he explained that there was a need to go along with the mass movement (read: introduce a form of popular democracy), and regulate water flows for the production of electricity and the use of irrigation. He suggested that people could be given an idea about development by ‘building a dam’ (Pandey, 1988: vol. 4, p.4-5).

In Nepal, these ideas came to be discussed more broadly, when, in a cascade of events, the Rana regime collapsed, technical assistance to Nepal was formalized and foreign donors entered the country. In January 1951, the Americans signed an official agreement with the Ranas for technical assistance, marking the start of an era of international aid to Nepal (Skerry *et al.*, 1992). One month later, however, in February 1951, the Rana government fell. The transition government broke radically with Rana policy, but not in regard to international cooperation (Stiller and Yadav, 1978). The agreement with the US remained in place, a second agreement for technical assistance was signed with the FAO in July 1951, and in 1952, a third agreement in relation to Indian economic assistance followed (Theuvenet, 1953; Rauch, 1954; Mihaly, 2002 [1965]). The latter was, in many ways, a formalization of the involvement of Indian engineers and military advisors in Nepal since the 1940s (India considered the Himalaya as the natural border between India and China). These organisations – the USOM, FAO and UN water experts, the Indian Aid Mission (IAM), and a handful of Nepalese state planners and engineers – were the main actors in discussions on irrigation and ‘water resources development’ in Nepal, shaping the debate on the hydraulic mission.

Figure 7.11: Bhim Bahadur Pandey and other men of the state going abroad

> 1943: Sardar Bhim Bahadur Pandey (right) with Bijaya Shumsher JBR (Jung Bahadur Rana). This portrait shows new masculinities, displaying a performance of being educated and 'civilized' like their British counterparts and other Western statesmen (Pandey, 1988: volume 2/3, between p.226 and p.227).

∨ **June 1946:** Nepalese delegation in India on their way to England. From left to right: Sardar B.B. Pandey, Babar Shumsher Rana, Lord Pethick-Lawrence, Shankar Shamsher Rana, Prakash Jung Thapa. Also this picture shows new performances of masculinity, displaying a meeting between men as administrators and military personnel who represent the state. In facing each other, the gathering is displayed in the photo as a 'meeting', reflecting a new policy of building international diplomatic relations (Pandey, 1988: volume 4, before p.1).

In these debates, the 'TVA idea' and Chitwan District featured centrally. In 1952, on a tour through selected parts of Nepal, Pandey suggested to Paul Rose, the first director of the USOM in Nepal, to start a project in the Rapti valley. This idea appealed strongly to the Americans and the Western experts of the FAO and the UN. The goal of US technical assistance in Nepal was 'to help make life better for the farmer and increase the productivity of his land' (USOM, 1958: 8). The prerogative of this (American) vision was to use available resources more efficiently, as exemplified by the TVA, raise productivity, and create an independent and less stratified nation of citizens – one that would form 'a stone in the arch of world freedom and progress' (USOM, 1958: 7). In this vision, technology and the concept of 'resources' was critical. The application of modern technology was believed to provide for a spectacular demonstration of the benefit of technical assistance to the common people – the spectacle of technology itself (e.g. roads, canals, dams, seeds, DDT) sufficient for Nepalese villagers to abandon 'backward' agricultural practices and win their hearts for popular democracy (USOM, 1958; Mihaly, 2002 [1965]). For this, land and water – conceptualized as 'resources' – had to be used efficiently, redistributed if necessary through land reforms, to raise living standards and satisfy the 'rising expectations' of villagers in Nepal (Mihaly, 2002 [1965]; Staples, 1992). For Western agents, the 'underutilized' and 'empty' space of Chitwan appeared as an ideal place to build a 'TVA in Nepal' (Sharma and Malla, 1957). Illustratively, the first FAO mission to Nepal identified the 'plain at the foot of the mountains [the Terai]' as the most promising agricultural area in Nepal (Rauch, 1954: 2). Evidently, reclaiming the 'unused' lands in the Terai for agricultural production was destined to be an arduous and capital intensive task, both Nepalese administrators and foreign experts knew this. Nevertheless, it was assigned a top priority by Western experts because it was seen as a critical strategy for turning an 'overpopulated' Nepal into a stable democracy (Maskey, 1978). It was believed that the Terai frontier, starting in Chitwan, could function as a 'safety valve' for stability, democracy and development in Nepal, making efficient use of land and water resources, and applying new agricultural technology (Shresta *et al*., 1993: 789).[67]

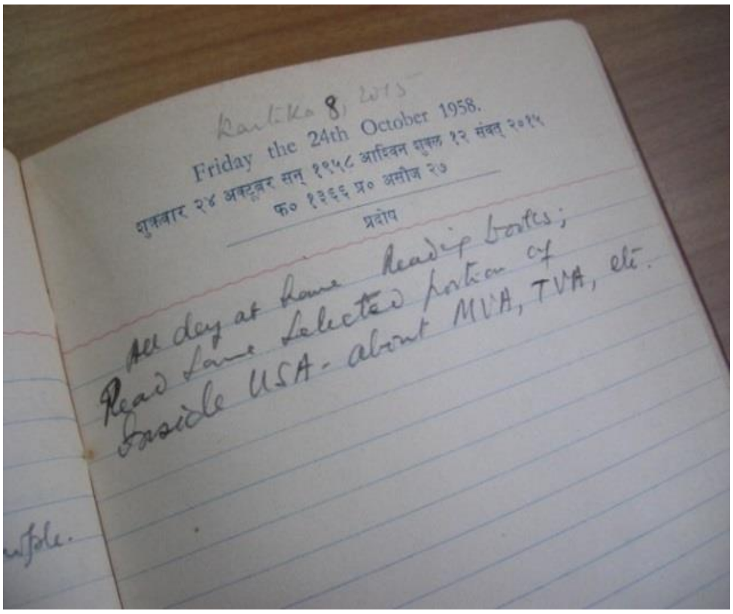
It was in this context that the RVDP was conceived and implemented in Chitwan District between 1954 and 1960. Modelled after the TVA, the project was conceptualized as a 'river valley project', hence the name *Rapti Upatyaka Bikas Yojanna* or 'Rapti Valley Development Project' (Sharma and Malla, 1957). Also the name 'Rapti Valley Multipurpose Development

[67] India and Nepal were considered to exist at such a critical juncture in the 1950s that two influential figures of America's liberal development entourage visited the countries, David Lilienthal ('Mr. TVA') and Wolf Ladejinsky ('Mr. Land Reform'). Lilienthal visited India in 1951 as a private consultant, giving radio interviews and visiting river valley projects (Klingensmith, 2007: 95-97). He also visited the watershed of the Kosi river by airplane, flying into Nepal up to about 15 kilometres from the summit of the Mount Everest, calling the Himalayas 'the largest source of hydroelectric energy in the world' (Lilienthal, 1953: 212). Ladejinsky was employed by the Ford Foundation, India as a consultant on agrarian reform. He helped to draft land reform policies in Nepal in the late 1950s (Mihaly, 2002 [1965]; Stiller and Yadav, 1978; Skerry *et al*., 1992).

Project' was used (Gee, 1959; Donner, 1967) and in 1956, a new constitution was drafted for the 'Rapti Valley Multipurpose Development Cooperation Service' (noted in the diary of K.B. Malla, project co-director of the RVDP, 20 September 1956). As the TVA, the RVDP was set up as a regional development corporation, as an inter-agency project of the Nepalese government and the USOM (Mihaly, 2002 [1965]), and the Rapti Valley Multipurpose Development Board was managed by a Nepalese and American co-director (Donner, 1967). Similarly to the TVA, it was designed as a multipurpose project, including land distribution, settlement, road building, electricity generation, town planning, and malaria eradication, as well as the introduction of chemical fertilizer, irrigation, health posts, schools and the construction of a saw mill (Sharma and Malla, 1957; USOM, 1958). The project was designed as a model of multipurpose development for Nepal, to show the benefits of 'unified' use of natural resources. Chitwan featured as the main development area in Nepal's first five-year development plan (1956-1961) and the RVDP received high policy attention (Shrestha *et al*., 1993). In 1956, the first 'agricultural exhibition' (*krishi mela*) was held in Chitwan, opened by the king, and the diary of the Nepalese co-director of the project, Krishna Bam Malla, makes note of frequent conversations with Pandey, then secretary of the NPC, both in Chitwan and in Kathmandu. His diary also reports dozens of high-level government officials who visited the project. As river valley projects in India, the RVDP was compared in the image of the TVA. The diary of K.B. Malla reveals that he was reading literature on the TVA (see Figure 7.12), and also that he participated in meetings of the 'River Valley Committee' at the secretariat of the NPC (noted at 8 and 9 May 1958). In this regard, the RVDP was a 'TVA in Nepal'.

In the end, the RVDP became a project that did little on irrigation and improved use of water resources, even though it is clear that the Rapti valley had been selected because of a perceived potential of 'unused' land *and water resources* (Sharma and Malla, 1957: 76). The project focussed eventually on malaria eradication, road building, and the ploughing and distribution of land – not on building multipurpose dams and irrigation works (see Figure 7.13 for an impression). The RVDP however was the flagship of multipurpose development in the 1950s, playing a role in the introduction of the hydraulic mission in Nepal. The RVDP changed thinking among administrators in Nepal, it provided public officials with a critical first experience of river valley development, and the project was as a nursery for Nepalese planners and engineers to test new ideas on 'water planning'.

Figure 7.12: A Nepalese project director reading literature on the TVA



Kartika 8, 2015
Friday the 24th October 1958,

'All day at home reading books;
Read some selected portion of
"Inside USA" – about MVA, TVA, etc.'

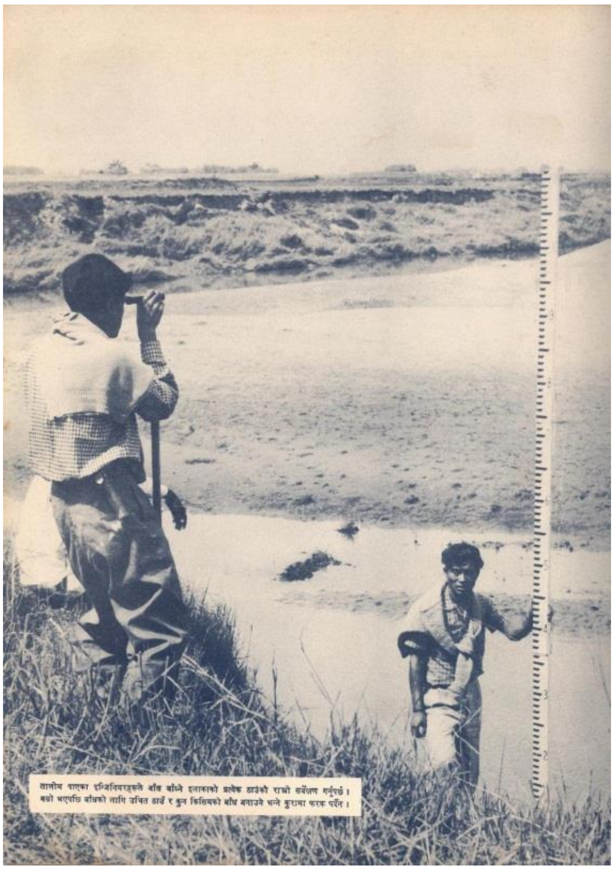
[MVA stands for Missouri Valley Authority, TVA stands for Tennessee Valley Authority, and "Inside USA" is a book written by John Gunther, 1947.] Obtained from the diary of K.B. Malla, co-director of the RVDP.

Furthermore, the 'TVA idea' and the liberal modernist vision of the West that it promoted, informed how 'the development problem' was defined in Nepal. India had already established relations with the West for a long time, and had acquired a cultural-political space in the world through its links with the British empire. In contrast, Nepal was incorporated in the global relations of production in the 1950s through foreign aid, and since then, its link with the West has exclusively been defined through bikas – development (Tamang, 2002: 313-314). The technocratic, apolitical and bureaucratized 'management' of development and natural resources, as conceived and promoted in Nepal in the late 1950s and 60s in the image of the TVA, has become a particular characteristic of a 'bikase' culture and society in Nepal – a depoliticized technocratic culture of development that is considered by some to remain acute in Nepal (Panday, 1999; Tamang, 2002; Shrestha, 2008; Panday, 2009 [1999]). This culture can be seen to have been born out of the liberal modernist assumption that professionalized, overarching management of economic and natural resources can be reconciled with grassroots democratic participation – the TVA idea *par excellence* (Klingensmith, 2007).

Figure 7.13: New performances of masculinity in the Rapti valley and Terai (1950s)

1. ∧

3. ∨



2. ∧

4. ∨

1950s: These pictures show early development works in Chitwan and elsewhere in the Terai in which the USOM was involved, taken from promotional booklets to show the public the benefit of technical assistance to Nepal (USOM, 1958; USAID, 1961). Photo 1 shows an American technician instructing Nepalese men. Photo 2 shows survey works. Photo 3 shows a Nepalese technician spraying DDT in a homestead in Chitwan. Photo 4 shows the ploughing of land. Photo 1 shows a typical American performance of masculinity of that time: 'plain-spoken, down-to-earth men [note the cap and working clothes], hard-boiled but big-hearted idealists, pragmatic visionaries intent not only on building modern projects but on making modern men' (Klingensmith, 2007: 82).

... to be continued on the next page

...continued from the previous page
This photo also shows a classic construction of the relationship between technical advisor and host counterpart of 'know how show how' [see the pointed finger] (see Packard, 1997 for an elaboration on malaria). In contrast with the American constructor, Nepalese engineers, technicians and workers show as the passive agent: listening, watching and using technology, depicted as relatively docile men. Generally, men's actions are presented in relation to the spectacle of technology itself. Photo 2 suggests that Nepalese engineers associated their performance (more) with white-collar employment [note the dress of the men].

7.5.3 From multipurpose water resources development to irrigation

In the 1940s and 50s, the growth of professional divisions in the government administration increasingly produced competition between disciplines and organisations. Illustratively, the earlier mentioned first agricultural engineer of Nepal, Huta Ram Baidya, returned to Nepal in 1947 from his studies in India to assume public service. As elsewhere, debates were held between civil engineers and agricultural and rural extension professionals, particularly in relation to irrigation, and administrators came to compete for spheres of influence for 'their' organisation, a practice that is sometimes referred to in literature as 'empire building' (Stiller and Yadav, 1978: 104-105; see also Gyawali, 2009). In this context, debates on irrigation and (multipurpose) water projects in Nepal in the 1950s centred on two issues: (1) the appropriate 'technical' approach for water resources development – the sort of projects to focus on; and (2) the location of administrative authority – the approach for project control and implementation. Basically, the debates took place at two levels, between experts from the West and administrators from Nepal and India, and between Nepalese planners and engineers who came from different disciplinary backgrounds and worked for different agencies.

Generally, views on development in Nepal in the 1950s were most clearly articulated by American and Indian professionals – not by Nepalese administrators. The US, through its programme of the USOM in Nepal, intended to have a 'nationwide impact' in the country, and was eager to help the 'central government' to formulate and implement 'national programmes' (Skerry *et al*., 1992: 8). The goal of the Americans was to raise the living standards of the rural masses *throughout the country* in order to create a stable and prosperous democracy (Mihaly, 2002 [1965]). In contrast, India, through the IAM and the work of experts of the Indian Administrative Services, urged Nepal to undertake 'a very restricted development programme for the near future', while building up the administrative apparatus for national planning (Stiller and Yadav, 1978: 161). The overriding concern of Indians, based on experiences in their own country, was nation-building, and the production of projects and public works that could show for modernity and national progress – presenting India as a leader of development in the region. Internationally, the promise of American agricultural modernism and the model of the TVA was absolutely hegemonic, also in India (Scott, 1998; Klingensmith, 2007), but regionally, the socialist Nehruvian model of planned development and national progress deeply inspired Nepalese planners and engineers. In the course of the 1950s, it can be said that the 'Nehru model' of India won over the 'TVA model' of the US, though these supposedly distinct development philosophies are not easily separable.

Indian professionals, particularly engineers, had a big influence in the early discussions on development and water resources planning in Nepal. The first hydropower plant and modern irrigation systems in Nepal had been built by British and Indian engineers (see above), Indian engineers had the lead in water resources surveys for the preparation of the Kosi (1954) and Gandaki (1959) treaties, and Indian engineers, unlike the American technicians of the USOM, were acquainted with the economic situation and culture in Nepal. In addition, prime minister Nehru himself promoted national planning in Nepal, inviting Nepalese delegations to Delhi and making Indian experts available for setting up an administration and civil service in Nepal (Stiller and Yadav, 1978). Furthermore, most Nepalese planners and engineers had been educated in India and they had a similar professional background as their Indian colleagues. In this context, in the 1950s, 'water resources development' in Nepal, though originally a 'TVA concept', *became* the domain of Indian engineering expertise and was narrowed down to a 'question of irrigation works' (see below). This explains perhaps why the RVDP is not mentioned in contemporary accounts of water resources development (see for instance Bhattarai, 2009) and seems to have lost its meaning as (one of) the *first* multipurpose river valley project in the country. The RVDP was supported by the US and was controlled by planners and agriculturalists who were considered by Indian and Nepalese engineers to compete for spheres of influence. Pandey, initiator of the RVDP, had been trained at Calcutta University in commerce (Pandey, 1988), and Malla, the Nepalese co-director of the RVDP, was an Indian trained agricultural scientist (Sharma and Malla, 1957). Likewise, Paul Rose and Harold Dusenberry, respectively country director and chief agriculturalist of the USOM in Nepal, were agriculturalists. They had worked as agricultural extension agents in the US and brought a focus on rural works and agriculture to the RVDP (Skerry *et al*., 1992). It is important to note here that also these 'other men' (see Chapter 5), and not just Indian and Nepalese engineers, talked in the 1950s about water resources development.[68]

The first issue of debate was the appropriate 'technical' approach for water resources development, and the sort of projects to focus on. A consensus that was quickly established between foreign experts and national administrators, was the view that the nation of Nepal was in great danger because the country faced an immediate 'food problem' due to 'overpopulation' and 'rapid' population growth (Rauch, 1954; UN, 1961). Food shortages

[68] It also appears that high-level policy attention among Nepalese planners and engineers, in relation to water resources development, shifted in the 1950s to the Karnali, the 'last' Himalayan river basin for which no treaty was made yet. Illustratively, during an official visit in the US in April 1960, king Mahendra took up the matter himself and requested president Eisenhower to assist with a study of the 'Karnali project' (Dhungel, 2009: 31).

were as old as Nepal but it was now framed as a national concern of the state (Regmi, 1999 [1972]). The focus was on food production in rice, which would need irrigation works. This act legitimized the claims of Nepalese and Indian planners and engineers for state authority, supporting 'their' quest for national progress and modernization, it created an urgency among the state elite to 'help' the rural masses of Nepal, something that greatly concerned Americans and other Westerners in 'their' quest to move the country from autocracy to democracy (Skerry *et al*., 1992). From this point on, Western experts from the FAO, and Nepalese administrators who saw in the TVA a type of model for multipurpose development, appear to have advocated for relatively ambitious, high-modernist plans for 'integrated use of water resources', aiming to modernize agriculture and increase productivity (Theuvenet, 1953; UN, 1955). Illustrative were the meetings of the 'River Valley Committee' at the secretariat of the NPC (see diary of K.B. Malla, noted at 8 and 9 May 1958). In contrast, Indian experts, and with them the majority of Nepalese planners and engineers, aspired to get involved in concrete land reclamation and irrigation projects, also as a means to show national progress and ascertain their newly acquired status as a 'new nation'.

These contradicting views and contesting claims of knowledge are reflected in foreign studies on Nepal from that time. For instance, the agreement between the government of Nepal and the FAO stipulated that an expert would visit Nepal: 'To advise and assist in [land] reclamation and irrigation problems with particular attention to surveys of water resources *for irrigation.* This expert shall [also] work in cooperation with a hydro-electrical engineer, giving special attention to the *integrated use of water resources*' (emphasis added) (Theuvenet, 1953: 1). Also, equally contradictory, the first UN report (1961) on 'Multiple-Purpose River Basin Development' in Nepal (note the title) stated that 'Nepal's rapid population growth is raising a serious food problem', and that '[t]he Government of Nepal is therefore giving high priority to irrigation projects' (p.74). The UN report especially reveals that high modernist, Western-type ideals for 'multipurpose river basin development' were effectively narrowed down to a question of 'irrigation projects' – the expertise of Indian and Nepalese engineers. Saliently, the FAO ended up sending a Dutch civil engineer to Nepal as a 'water expert', S. Theuvenet.[69] He brought with him the Dutch experience in irrigation in rice production from the East Indies, a school of thought significantly different from the Indian engineering tradition (Ertsen, 2005). The work of the FAO focussed primarily on improving the (rice) food condition in Nepal. As an expert of the FAO, Theuvenet – and thus not an Indian engineer – produced the first (national) study on water resources development in Nepal, the 'Report to the Government of Nepal on Irrigation' (1953).

[69] In his report (1953), Theuvenet refers to the population density in the Netherlands in comparison with the population density in the Kathmandu Valley, and he refers to the *subak* system of Indonesia.

There were other reasons why the discussion on 'water resources development' in Nepal became a question of food and 'irrigation projects'. Western experts and Nepalese planners and engineers quickly learned that a straightforward introduction of a high-modernist TVA-type model in the country was very difficult. Particularly the prospect of constructing big multipurpose dams in the Himalaya appeared grim. First, they found that recommendations had to be modest because of an acute shortage of experienced technical personnel and a complete lack of reliable agricultural and hydrological data (Theuvenet, 1953). Second, they observed Nepal's extreme physical and climatological conditions. It was realized that the modernization of agriculture, more specifically, the expansion of agriculture in the dry season, ideally relied on the capacity to store water for irrigation but that erosion would damage irrigation works, thus bringing high cost for construction and maintenance of infrastructure. Furthermore, the long and narrow shape of the Terai in Nepal was considered to require expensive canal construction near the mountains, and the development of hydropower in Nepal for tubewell irrigation was perceived to form 'an unsurmountable difficulty in [the] view of the limited financial power of the country' (Theuvenet, 1953: 9). In other words, total control of Nepal's watersheds for 'integrated (read: national) use of water resources' was not going to work; the country did not have the engineers and capital for it, and donors were unwilling to provide these resources (Mihaly, 2002 [1965]). In this context, Theuvenet went as far as to say that '[i]t will probably be desirable not to consider "big" schemes such as multipurpose dams but to concentrate on (...) irrigation works (low, easily-constructed masonry dams ...) for the three regions of Nepal: the main valleys, the uplands and the Terai' (1953: 24). Illustratively, multipurpose dams were explicitly mentioned in the report as the ideal horizon for planners and engineers, but thus not recommended at that time. Later policy statements reveal the same dynamic. The UN report (1961) noted: 'It is the view of [the] Nepalese Government that the construction of storage reservoirs should not be included in the first five-year plan of economic development. *Storage reservoirs will, however, be considered during the succeeding stages of development, when it is felt, technical personnel and funds will be more readily available*' (emphasis added) (p.74).

The second issue of disagreement between Western experts and Nepalese and Indian administrators was the location of administrative authority for water resources development. On this point, Nepalese administrators, engineers and agriculturalists alike, appear to have looked determinedly to Nehru and India. It was from the perspective of nation building – not democracy building – that Nepalese planners and engineers agreed with the recommendations of Western experts for 'irrigation works' to ensure 'rapid progress' (see Theuvenet, 1953: 24-25). In their view, and that of most Indian administrators, central state agencies were destined to be the main authority, being more important than the 'autonomous', regional development boards that were put in place in some projects (see RVDP in Nepal; Damodar Valley Corporation in India), linked to the administration through a high-level policy body (GON, 1956). It appears that central stage agencies were more strongly associated with images of sovereignty and national progress, perceived as a place by planners and engineers to display their skills and perform their new (modern) identities. These debates are reflected in the sector-approach in development that both Nepal and India would embark on in the 1960s.

Many Western agents promoted 'rapid progress' in Nepal with a view to create democracy, in an attempt to make villagers assume 'the responsibilities of the individual' in 'national life' (wording of Paul Rose, see Skerry *et al*., 1992: 37). From this perspective, Theuvenet warned explicitly against an over-centralized state government, much like Lilienthal did in the US for the TVA (1953). In other words, professionals should lead water resources development to ensure efficient use of water flows through the application of technology, but getting farmers' organisations involved in irrigation was considered equally important for the creation of stability and democracy. In this view, in words that Pethick-Lawrence had used to address the Rana delegation in 1946, Theuvenet explained to the government of Nepal, that 'cooperative farmers' organisations [should] form sound pillars of society', stressing that 'their formation and improvement [should be] an important task for the Government of Nepal' (1953: 22).[70] Clearly, Nepalese planners and engineers (also) shared concerns about social reform and (farmer) self-reliance, and 'cooperative societies' were placed prominently in the first, national five-year development plan of Nepal (1956-1961) for more general agricultural development (GON, 1956; Stiller and Yadav, 1978). Irrigation projects, however, mainly became the mandate of the state and water resources development a mission of engineers.

7.5.4 'Now it is left to man's ingenuity and resources to utilize [water]'

In the course of the 1950s, nation-building and nationalism, more than the promotion of grassroots democracy, surfaced as the immediate concern of state and policy elites. The 'nation of Nepal' was essentially non-existent. For most Nepalese villagers, like the Tharu in Chitwan, the idea of Nepal as a 'nation' was alien and there was no shared 'Nepalese identity' among the rural population (Stiller and Yadav, 1978; Whelpton, 2005). The villagers knew their rulers as feudal landlords, and their attitude towards state officials and government interventions was characterized by a certain scepticism – 'ignorance' as administrators and foreign experts perhaps would have said in the 1950s. In Chitwan, many Tharu cultivators were reluctant to have their land rights registered in surveys in the 1950s and 60s, as they expected that this would expose them to excessive taxation (Guneratne, 1994). In this context, the promotion of centralized state planning and the act of creating state agencies – not the implementation of development projects per se – came to be seen as symbols of the nation. In 1955, two months after he ascended the throne, king Mahendra initiated investigations that resulted in the first Nehru-style, five-year development plan of Nepal (1956-1961).

[70] Saliently, Theuvenet (1953) mentioned the *subak* system of Bali as a an example of a cooperative farmers' organisation, completely ignoring Nepal's indigenous tradition in community management.

Illustratively, he had begun to refer to a 'five year plan' in his speeches and the king wanted a 'plan for the nation' to show for at the meeting of the Colombo Plan in 1955 as evidence of modernization (Stiller and Yadav, 1978: 159). Then, in 1961, the king instituted the Panchayat government. Key to the legitimization of 'indigenous control' of the state apparatus in Nepal, as Tamang (2002) writes, was the doctrine of 'development' – *bikas* – as '*the* national project' (emphasis original) (p.314). The claim of the king was essentially that Nepal's political leaders had been incapable to lead the country and had allowed foreign agencies, notably Indian experts, to take control in planning (Stiller and Yadav, 1978). As these events illustrate, the prime objective became nation building and the build-up of a strong centralized government as a symbol of the growth of a nation. It was in this context that new state-local relationships were forged.

As in India, it mainly was the idea of the conveyance and delivery of water that was taken from irrigation engineering, and the idea of total control of water resources that was taken from the TVA as an inspiration for irrigation management and planned development in Nepal. Noteworthy, the FAO and UN reports were highly instrumental in establishing an international, high-modernist 'TVA image' of Nepal which held that the country's future lay in unified water resources development, both for irrigation and hydropower. Theuvenet (1953) noted that '[t]he potentialities for the extension of irrigation are great' because 'in several regions there is the proper quantity of water available' (p.9). He also noted that 'Nepal possesses abundant [water] resources for hydro-electric power' (p.4). Similarly, the UN report (1961) mentioned that 'the water resources of the region [Nepal] are ample, and, with suitable structures, can provide a regulated supply [for irrigation] to most of the cultivable areas' (p.70). The UN report also stated that '[t]he water power potential of Nepal is the country's greatest asset' (p.76). This view – the hydraulic dream that Nepal's future lies in irrigation and hydropower development (for domestic and export goals) – is still hegemonic in policy making circles (MOWR, 1981; Gyawali, 2001; 2009; 2013; Bhattarai, 2009).

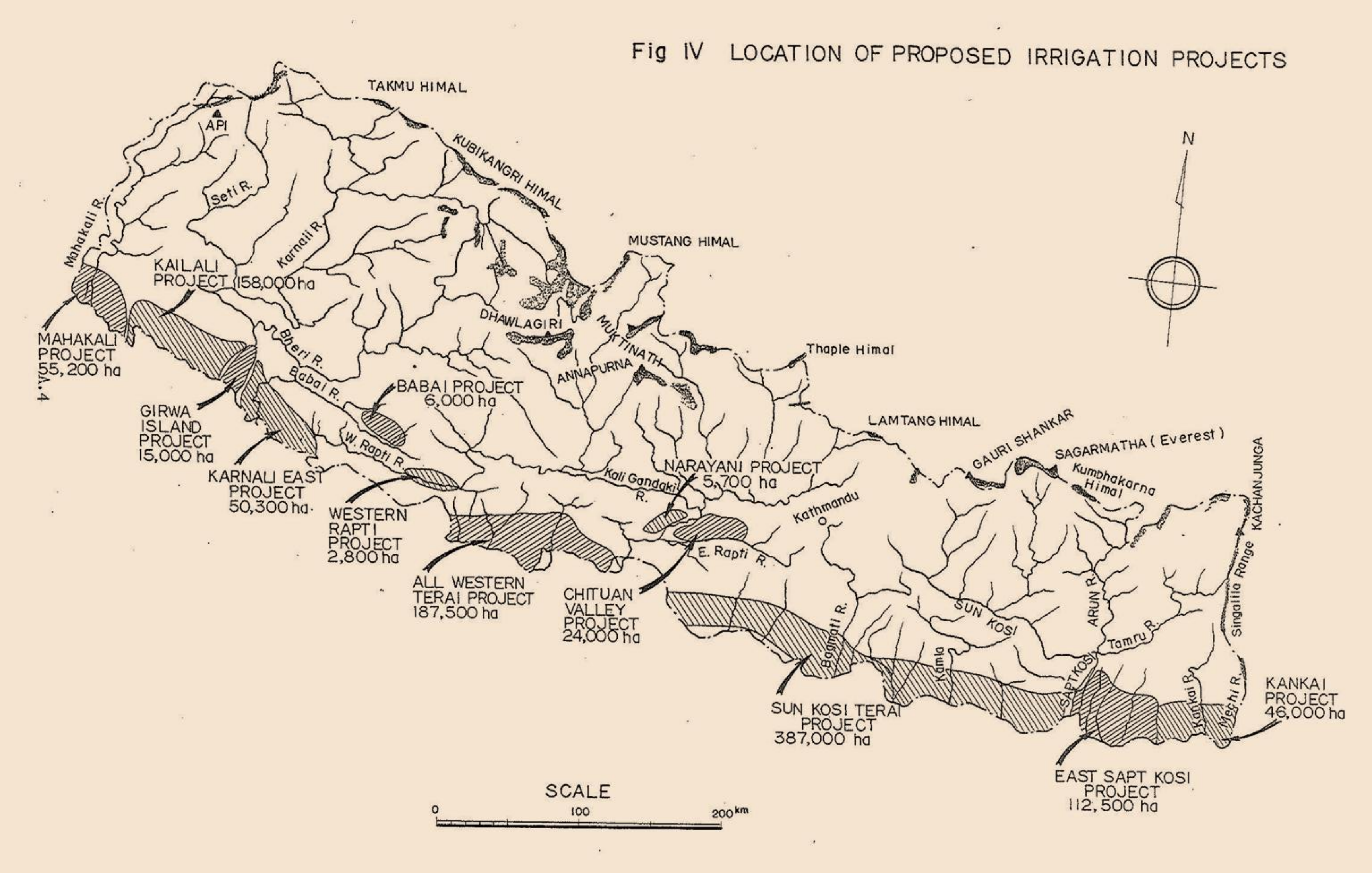
While the new Panchayat government launched a modest programme for 'minor irrigation' with support of India (WECS, 1981; Sharma, 2004), and engineers proceeded with the implementation of selected irrigation projects in the mid-1960s, among others in Chitwan, the discussion at high policy levels on irrigation and water resources development was increasingly embedded in national rhetoric, characterized by the charismatic and high-modernist language congruent with TVA ideology. Particularly illustrative are the words of Krishna Murari, 'member irrigation' of the IAM in Kathmandu, who spoke about the role of 'irrigation and drainage' in the development of agriculture at the second agricultural conference in Nepal in 1964 (Murari, 1966: 55). In his introduction, he elaborated that '[m]an in the beginning started life as an animal and his entry into civilization has been marked by his bringing into use water (...) in a way different from that provided by nature, for his prosperity and wellbeing. [It] was marked by (...) bringing into (...) use (...) water for producing the required food and for irrigating the land'. He also remarked that 'Mother Nature, in Nepal has provided sufficient water to meet its entire irrigation needs. *Now it is left to man's ingenuity and resources to utilise the same*' (emphasis added) (p.56 and 60). He concluded his contribution with the argument of a simple calculation: 'The requirement of water for the total cultivated area of about 56 [lakh] acres in Nepal will be of the order of 112 lakhs acres ft. It is estimated that the total water that outflows from Nepal territory through its rivers is of the order of 1680 lakh acre ft., i.e. *about 15 times more than the total requirements*' (emphasis added) (p.55).

These quotes mark the transformation of international ideas on water planning into an articulated and localized definition of the hydraulic mission in Nepal. As for the TVA, irrigation and water planning was (now) presented as a teleology, a truth of civilization – a definite history with a starting point ('man started life as an animal'), a middle ('utilise man's ingenuity', 'bringing into use water for irrigation') and a determined end goal ('man's entry into civilization', 'irrigating the land'). As with the high-modernist language of the TVA, the popular appeal of the words of Murari lay in its emancipatory and liberating outlook for prosperity and wellbeing, measured by Western standards. They transcend the cool utilitarianism of professional disciplines and technocratic management, touching a deeper register of national strength, competence and coherence (cf. Klingensmith, 2007). Similar to the TVA, it reveals that water resources development was rationalized as an apolitical and modular logic replicable throughout the country, stripped of the practical realities that administrators faced in the execution of projects. Hence, the initial reservations of water experts – acute shortage of technical personnel, lack of reliable hydrological data, extreme physical and climatological conditions, the need for different approaches of irrigation development in the Mountains, Hills and Terai – were no longer mentioned and largely discarded. The quotes reveal the establishment of an unprecedented faith in the ordering of nature and society; a view that holds an ultimate promise that a new world order can be created in Nepal by using water resources wisely (cf. Scott, 1998).

What the contours of this new world order were supposed to look like was spelled out in detail. The first master plan in Nepal on irrigation (HMG-N, 1970b), as noted, a document produced by international water experts, and Nepalese and Indian engineers (see Chapter 6), left no space for other realities: 'The future irrigation in Nepal should be year-round irrigation by which two or more crops a year can be obtained. To this effect, the ample water resources of the country should be fully utilized. New irrigation projects should be planned to include not only the main and secondary canals, but also the tertiary and smaller canals, terminal distributaries, complete drainage system, network of farm roads, readjustment of lands, flood prevention works, communication networks, irrigated farmers' training centre etc. The intake of the irrigation water should be located on larger rivers than before so that irrigation water could be available even in the dry season [and] all the available lands [in the Terai and inner Terai area are to be fully developed] under the above-mentioned conceptions' (HMG-N, 1970b: S.2). (see Figure 7.14 for an outlay of the plan and the location of proposed irrigation projects). This quote defines the hydraulic mission in Nepal in a very high-modernist form; planners and engineers of the state envisioned nothing less than a complete re-design of the country, from the building of big intakes in the large rivers to the complete lay-out of 'terminal distributaries' and the 'readjustment of lands' at the field level, enabling agricultural harvest (rice) to increase. This vision reflected the irrigation engineering vision in India at that time and also the first 'Command Area Development Programme' that it launched in 1974 (personal communication professor Linden Vincent, 2-6-2014).

The ambition of planners and engineers in Nepal for total state control of water resources – mainly for irrigation in spite of much talk on hydropower generation – has proven to be remarkably resilient and has basically remained hegemonic until today. Water planning and irrigation policy objectives have changed radically since the 1980s, but the high modernist principles that underpin the logic of water resources development, since 1946 in Nepal, have largely gone unchallenged, although emphasis on what can be considered the 'TVA principles' have shifted through time – total management, unified watershed-based regional development, efficient use of resources, democratic participation, equity (see below). In fact, these 'Nepalese ideas' on irrigation and water resources development are deeply entrenched in Western thinking. Illustratively, five decades after the 'TVA idea' had been introduced in Nepal, in regard to the Arun-3 project, a WB supported multipurpose project in the watershed of the Kosi river, the US ambassador in Nepal wrote to the State Department urging it to support the project because without it, 'democracy in Nepal would be in danger' (Gyawali, 2001: 51). Evidently, a strong, high-modernist belief that development and management of water resources can transform a nation is alive and kicking, both in Nepal and in the West.

Figure 7.14: A new experience of state irrigation development in Nepal in 1970



Source: HMG-N, 1970b (The first 'Master Plan of Irrigation Development in Nepal')

7.6 The hydraulic mission in Chitwan (1950s onwards)

The remainder of this chapter documents the implementation of the hydraulic mission in Chitwan, focussing on the RVDP and successor state irrigation development projects. It explores how some of the contestations at high policy levels (see above) translated to project implementation, and also what this meant for the existing practices of Tharu irrigation. As noted above (see Figure 7.4), between 1950 and 2010, Chitwan was selected by the government for a host of irrigation projects, too many to discuss here (see for literature on irrigation in Chitwan: Poudel, 1986; Khatri-Chhetri *et al*., 1988; P. Pradhan, 1989; Shukla *et al*., 1997; 1999; Shivakoti and Ostrom, 2002; Khanal, 1997; 2003; Shivakoti and Shrestha, 2005; Singh *et al*., 2014). The focus is on the main development and state irrigation projects in the district: (1) the RVDP (1952-1960); (2) the Chitwan Valley Development Project (CVDP), also known as the Chitwan Irrigation Project (CIP) (1972-1989); (3) the East Rapti Irrigation Project (ERIP) (1994-1998); and (4) the Irrigation Management Transfer Project (IMTP) (1995-2002). The projects are discussed in sequence. I occasionally refer to irrigation project engineers in the analysis who have worked in Chitwan District (see Annex 55 for a full list, it also mentions the various names of the irrigation office in Bharatpur)

7.6.1 Rapti Valley Development Project (1950s and 1960s)

Conceived as a river valley project, irrigation development and electricity production were originally conceptualized as priorities in the RVDP. To recall, the RVDP was set up as an regional inter-agency and inter-ministry project, having Nepalese and American co-directors, and falling under the authority of the ‘autonomous’ Rapti Valley Multipurpose Development Board. In a description of ‘works to be done’ for the RVDP, Malla describes *sichaariko bandobasta* (‘irrigation arrangements’) and *bijuli utpadan* (‘electricity production’) as the second and third priority of the project, after the ‘proper use’ of land for agriculture and settlement (Sharma and Malla, 1957: 76-78). ‘Electricity production’ in the RVDP, however, was not clearly associated with hydropower. There were talks about this in the 1950s, but mainly in relation to the Narayani river, the river that borders Chitwan in the West (UN, 1961). In the context of the RVDP, the Narayani river was only mentioned as a potential waterway to facilitate transport between Nepal and India, and also as a possible source for irrigation (Sharma and Malla, 1957: 64 and 72). In contrast, irrigation development was extensively discussed in the RVDP with the objective to improve agriculture. For a start, the existing irrigation practices of the Tharu – Malla mentions two canals in East Chitwan – were perceived as inefficient, described in terms of seepage losses and as insufficient to fulfil water requirements for irrigation (p.70). His observations were reflected in the views of planners and engineers at the first national agricultural conference in Nepal in 1958, who emphasized ‘the need for developing infrastructure to transform subsistence farming practices into modern, cash generating business’ (Dahal, 1997: 161). They also were reflected in the views of Western experts. The earlier mentioned UN (1961) report noted: ‘[t]he cultivators themselves present [a] problem [in Nepal], as they are over-dependent on a continuous supply of rainfall, and also tend to be wasteful in the use of water' (p.76).

The goal of the RVDP was to introduce modern irrigation technology, build water systems and rationalize water management in agriculture. For this purpose, the water resources in the valley were studied in an attempt to identify rivers for irrigation and other purposes. The 9 biggest rivers were identified for irrigation – excluding the Narayani river for the moment – and it was envisioned that a total of 145.180 bigha or 98.722 ha of land could be irrigated (Sharma and Malla, 1957: 21 and 78). Saliently, the identification of river resources and this figure had little meaning for the actual implementation of the project. As noted, the RVDP targeted the whole Rapti valley but ended up using only 27.900 ha of land for the settlement, mainly in West Chitwan, thus remaining far below the maximum perceived potential area for irrigation. The significance lay in the conception of a reality (or rather teleology) that all the agricultural land in Chitwan can be irrigated – an ideal that became central to the hydraulic mission in Nepal. Noteworthy, this ideal was produced in co-existence of local hydrological conditions and the related water use practices of the Tharu in the valley. As described above, most of the Tharu settlements were located in the vicinity of the Rapti and Riu rivers, exactly in places where river conditions were close to perennial. The Tharu were already tilling the most fertile parts of the valley and using the best locations of the rivers for irrigation practices. This was acknowledged and the RVDP 'ended up' targeting a relatively dry area in West Chitwan – a part of the district that was covered by tall grass, had porous soils and few seasonal streams, and was mainly suitable for maize cultivation (Khanal, 2003).

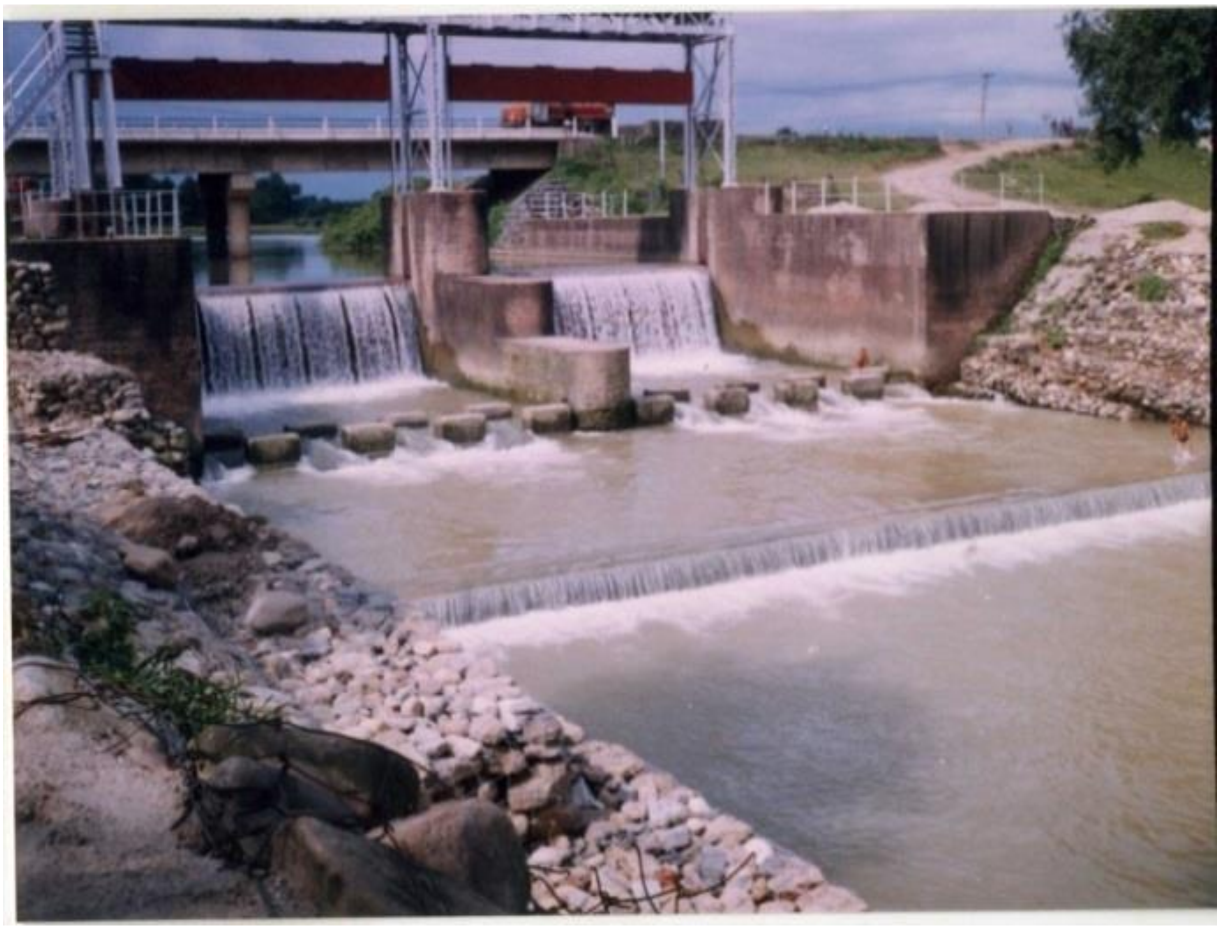
The planners of the RVDP were aware that they had selected one of the driest parts of the district for 'their' project (see Annex 54). However, the area was deemed suitable because it contained very few settlements. Furthermore, planners placed high trust in the application of modern technology and they envisioned that a modern irrigation system could supply the area with water. Illustratively, Malla noted that the cultivation of winter crops would only be possible if irrigation water was managed and described that an 'irrigation survey' was started for the purpose (Sharma and Malla, 1957: 89). In this context, many of the above mentioned persons visited the Rapti valley. Theuvenet, the irrigation expert of the FAO, visited the area east of Hetauda (1953). In 1956, Malla noted in his diary that he received a report on irrigation in the Rapti valley and the Terai, written by a foreign expert, presumably also from the FAO (noted at 8 January). In the same year, engineers from the Canal Department visited the area to discuss irrigation and bring equipment for a survey, among others, Garcha, the Indian chief engineer and Karna Dhoj Adhikari, one of the first Nepalese engineers of the department and a direct colleague of N.K. Agrawal (the Irrigation Man) and B.K. Pradhan (the Water Emperor) (noted at 30 and 31 March, 23 May, 12 June 1956 and 30 October

1958). Also Baidya (the first agricultural engineer of Nepal) visited Chitwan to discuss with Garcha, the possibility to start ‘some canal works’ (noted at 28 July 1956).

As can be distilled from this account, the RVDP provided a critical space for Nepalese administrators in the 1950s to develop ideas on irrigation and water resources development. They were in charge of the project and worked in cooperation with experts of the FAO, the USOM and Indian engineers on irrigation. In contrast, other big (irrigation) development projects in the Terai were controlled and executed by Indian engineers (B.K. Pradhan, 2009). The following quote, translated from the writings of Malla, illustrates how ideas among these actors developed: ‘There is scarcity of irrigation water in Tandi, Belaud and Kalabanjaar [praganna, West-Chitwan]. There is a lot of barren land in this area, because of the scarcity of water. Although the land lies within the boundary of three rivers, namely Khageri, Narayani and Rapti, it is said that water from the rivers could not be made available to the land because of insufficient budget to construct dams in these rivers. It was estimated that about 10.000 bigha [6.800 ha] can be irrigated if water is taken from the Khageri river. Water from the Lothar, [Rapti] and [Budhi] Rapti can be added into the system’ (Sharma and Malla, 1957: 72).[71] This quote reveals that the ‘TVA idea’ of building dams in the rivers, including in the Narayani river, did circulate among administrators but was considered too expensive. As a viable alternative, it was suggested to construct an irrigation canal system with headworks in the Khageri river to supply water to an area of 6.800 ha in West Chitwan. This idea, conceived as an integral part of the RVDP, formed the basis for the ‘Rapti Irrigation Project’ or ‘Upper Khageri Irrigation Scheme’, a project that eventually was approved by the government of Nepal and the Rapti Valley Multipurpose Development Board in 1960 (DIDW, 1967). The system was constructed between 1961-1967 when the RVDP itself was already terminated, and is now known as Khageri Irrigation System (KIS) (Khanal, 2003) (see Figure 7.15). N.K. Agrawal first and then K.D. Adhikari acted as executive engineers of the project.

[71] Original text: ‘Sinchaiko paniko aabhav pani tandi, belaud tatha kalabanjaarma cha. Panikai abhavle yahaka dherai jaso jamin bajho rahana gayeko ho. Khageri, Narayani tatha Rapti nadko trikon bhitra raheko jain bhayeta pani saano kharchale yi tinai nadima baadh lagauna napugne hunale paniko bandobasta yaha huna sakeko chaina. Khageri nadibata nahar banayema karib 10.000 bigha chadai nai paatna sakine aanuma garincha. Yaha paanima Lothar, Manauri ra Saano Rapti ko pani pani thapna aawasya sakinecha’ (Sharma and Malla, 1957: 72).

Figure 7.15: Intake of a modern irrigation system and a symbol of state planning



1990s: Intake of Khageri Irrigation System. It shows the headworks after rehabilitation. Three decades earlier, around 1970, it was inaugurated by the prime minister of Nepal, his presence and the intake itself signifying the importance of irrigation in state planning. I suggest that the intake has masculine connotations, displaying the ability of 'man' to control water flows. As new emblems of state power, they functioned perhaps as the 'new elephants' of the Terai, being part of new forms of statecraft. Obtained from the DOI office, Chitwan (2011).

Today, KIS is treated as a footnote in the irrigation history of Nepal, known as a 'typical medium-sized, extensively developed surface irrigation system' in Nepal (Khanal, 2003: 83). However, in the 1950s, it was considered much more than that – it embodied the aspirations of foreign and national planners to make Nepal a prosperous nation. For a start, the system was expected to meet three practical goals: (1) support the livelihoods of newly settled people, (2) produce surplus food grain for the growing population in Kathmandu, and (3) conserve foreign exchange reserves (UN, 1961; Khanal, 2003). The introduction of canal irrigation itself was also believed to provide for a demonstration of the benefit of technical assistance to the common people – the spectacle of canals and irrigation farming *itself* sufficient for Nepalese villagers to take 'individual responsibility', act 'free' and win their hearts for national progress and modern development. In this context, canal irrigation was importantly perceived as a pilot project, as a practice of research and development (R&D) for experts and farmers, and also as a 'show' for the common people to see what modern irrigation was about. This thinking is reflected in the earlier mentioned UN report on Nepal: '[The government of Nepal] has sought the funds and technical assistance from the [FAO] to construct a pilot scheme. It is envisaged that the pilot scheme will occupy about 2,032 hectares (5,000 acres). It is the consensus that a pilot scheme will *also* serve a useful purpose in training land managers, agronomists and irrigation specialists, and provide facilities where Nepalese villagers can be taught irrigation farming. The ultimate objective of the pilot scheme is to pave the way for large-scale farming, and to demonstrate the effective use of waters so as to provide optimum benefits to the farmer (...)' (emphasis added) (UN, 1961: 74).

The pilot scheme that is mentioned in the quote was the Rapti Irrigation Project, a development in which the FAO had become involved (DIDW, 1967). The USOM was reluctant to talk about 'irrigation works' in the Rapti valley (noted in the diary of Malla at 18 July 1956), it appears because the Americans preferred technical assistance over capital projects (Mihaly, 2002 [1965]: 205). In the end, however, also the FAO irrigation survey team that visited Nepal during 1959-1962 was not in favour of constructing a big irrigation system in the Rapti valley, as the proposal for a pilot scheme of 2.032 ha indicates (see quote above) (Sakiyama, 1971; MFAI, 1975; Khanal, 2003). They argued that the command area of the proposed system had a highly porous soil, suitable for maize cultivation only, and said that the water requirement of the soil in the Rapti valley was comparatively higher than the soil in the Indo-Gangetic plain (Khanal, 2003: 80). Nevertheless, the government of Nepal pursued the plan by using its own engineers and resources (ADB, 1972: 17). The construction proceeded as envisioned by the engineers of the Canal Department, for a scheme of 6.123 ha in the monsoon for rice cultivation and 2.800 ha in the winter for wheat (see Khanal, 2003)

The debates on irrigation development in the Rapti valley and the difficulties that the government of Nepal experienced in the construction of KIS, informed irrigation policy thinking in Nepal. Chitwan was basically the first and only place in Nepal where engineers of the Canal Department gained experience with building a 'large' irrigation system without foreign assistance (HMG-N, 1970b: 41). As mentioned above, other big projects were executed by Indian engineers or failed to materialize due to lack of funding. In this regard, the construction of KIS was (and is) a landmark project of the hydraulic mission in Nepal. The experiences in constructing 'big projects' in Chitwan and elsewhere in the Terai, contributed to the pursuit of a less ambitious, India-funded 'Minor Irrigation Programme' in the 1960s under the Panchayat government (Agrinaut, 8 June 1967). N.K. Agrawal was appointed as chief engineer of the programme. One of the first canal systems that was built under this programme was Pituwa Irrigation System in East Chitwan for an area of 600 ha (see HMG-N/USAID, 1986, p.121-137 for a background on Pituwa). In many ways, this programme can be seen to have been a thorn in the flesh of Nepalese engineers of the then irrigation department (DIDW). The programme was designed as a district programme, based on local initiative for project selection and its objective to develop small irrigation facilities far from the aspirations of some engineers to create a new world order through state irrigation development. In addition, the programme initially was institutionalized under the DA (and later under DIDW; see Chapter 3), forming thus a partial threat for irrigation engineers who sought to build up their own empire in the government structure.

7.6.2 Chitwan Valley Development Project (1970s and 1980s)

The Rapti or Khageri Irrigation Project was finished in 1968, providing supplementary irrigation in the monsoon to a projected area of about 6.000 ha. The completion of the system was an achievement but the system only partially supplied a reliable service of irrigation. The canals of the system were not lined, there was no drainage network, and the first kilometres of the main canal (running through a forest area) suffered from major inundation problems (ADB/Agrar, 1972). It also occurred that 'contractors' cut off water supply to operate fish ponds that had developed along the main canal. In these conditions, it only was an area of about 3.700 ha and mainly farmers with large land holdings that obtained water from the irrigation system (APROSC, 1978: 44-51). Overall, agricultural production in Chitwan had grown but not as an effect of the system. In 1964, 63% of the agricultural produce in Chitwan was (already) exported to the hill areas and the Kathmandu Valley (ADB/Agrar, 1972) and the increase of rice production in the irrigation command area from an estimated 1,3 to 1,9 ton/ha (46%) was mainly the result of using fertilizer and improved seed quality (APROSC, 1978: 24). As early as 1969, engineers diagnosed the problem of Khageri as a lack of 'water management' at the field level and the failure of the system to provide irrigation throughout the year (HMG-N, 1970b; ADB, 1972; HMG-N/FAO, 1976).

Planners and engineers were able to come up with a quick diagnosis because irrigation and water planning efforts had taken further shape during the construction of the project. As noted, in the course of the 1960s, in cooperation between Nepalese planners and engineers and experts from India, the FAO, UN, USAID, WB and ADB, the first master plan in Nepal on irrigation was produced (HMG-N, 1970b) (see Chapter 6). As described above, the plan envisioned the total control of land and water resources for irrigation development, similarly as had been conceived for the Rapti valley, but now on the scale of Nepal. When reading the plan, it reveals that Western experts and Nepalese engineers shared concerns on the effectiveness of existing government schemes which focussed on 'supplementary irrigation' in the monsoon. It also suggests that foreign experts had the idea that engineers, technicians and managing staff in Nepal were not fully acquainted with what modern irrigation could achieve. This can be distilled from the language in the plan. To illustrate, the plan mentions that 'year-round irrigation is *an unprecedented item* to Nepal' and that 'the farming practice under (...) year-round irrigation (...) *is quite novel not only for the farmers but also for the* *engineers, technicians and managing staff*' (emphasis added) (HMG-N, 1970b: 75). It was in this view that irrigation in KIS in Chitwan was seen as a 'problem'.

The lack of irrigation facilities and water control was seen in the plan as the most limiting factor for agricultural production, and the introduction of year-round irrigation was deemed absolutely necessary for a rapid and efficient increase of agricultural output in Nepal (FAO, 1969; Chapagain, 1972). As the plan mentions, it was expected that year-round irrigation would result in 'record-breaking increases' of crop production as shown in 'several south-east Asian countries under similar conditions of the tropical monsoon climate' (HMG-N, 1970b: 25). The plan envisioned to put the complete Terai and Inner Terai under year-round irrigation, and it divided the Terai plains in 12 'irrigation blocks'. Chitwan valley was one of these irrigation blocks, for an area of 24.000 ha, and was awarded the highest priority.

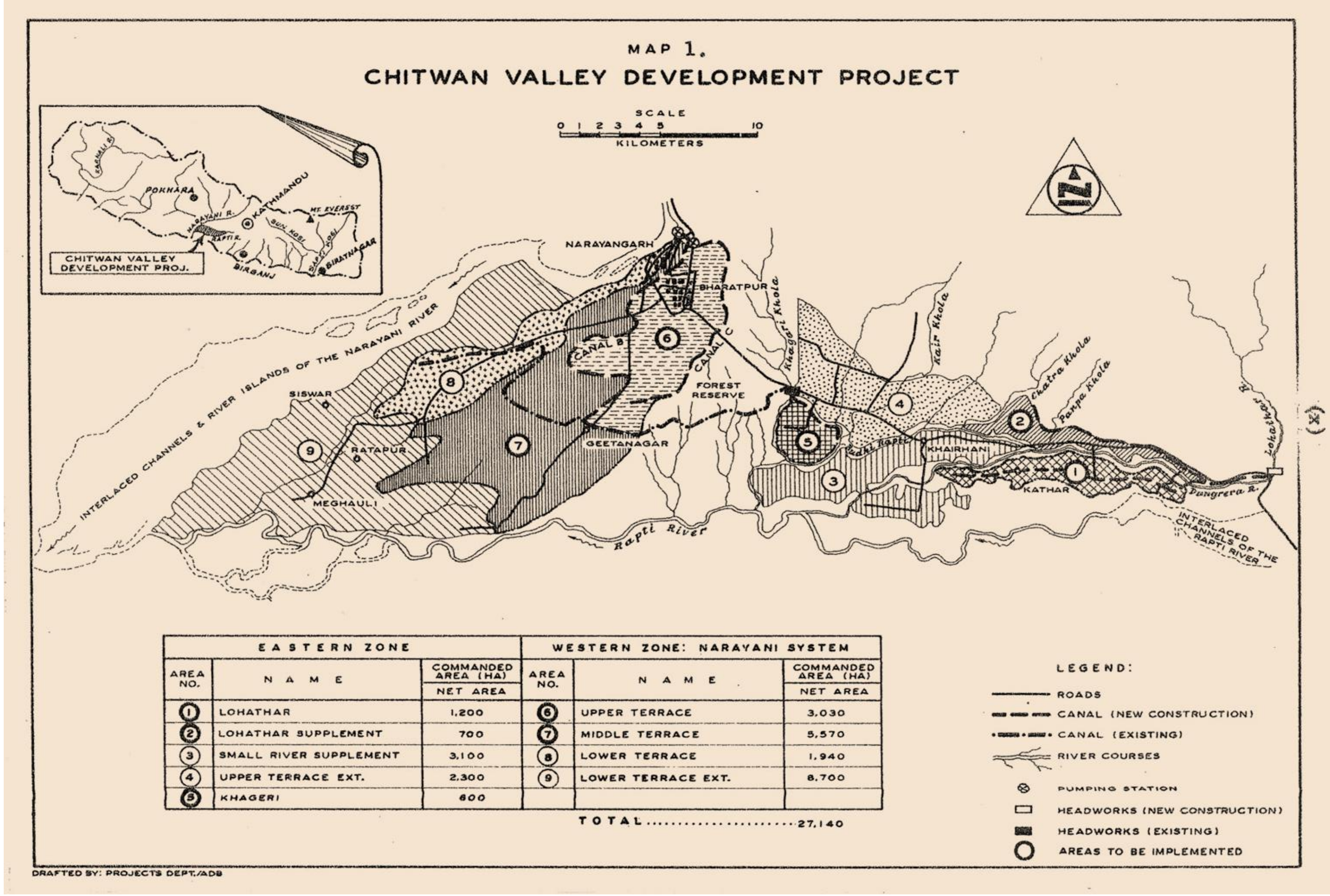
The master plan put actual water delivery at the farm level as its stated goal, envisioning elaborate infrastructure development down to the farm level – not just intake and main canals but also field distributaries, drainage systems and rural roads (HMG-N, 1970b). As noted, this vision reflected the irrigation engineering vision in India on command area development. The plan also proposed total administration of irrigation by government authorities, from 'intake' to 'terminal distributaries' through an elaborate structure of divisions. A scientifically informed state administration was deemed necessary 'for the successful performance of (...) year-round irrigation farming in the Terai because of the specific natural conditions in this area where the irrigation farming practices in the dry season and those in the wet season differ entirely' (p. 30). It was believed that a scientific implementation of technology could overcome Nepal's extreme physical and climatological conditions, and that farmers would willingly adopt new farming practices once introduced to year-round irrigation. This classical high-modernist faith also is reflected in the plan's statement of the 'need for [a] model pilot project' (p.75) – again to test the idea of year-round irrigation in Nepal as a practice of experts and also to show to the common people the benefit of modern irrigation development. Not surprisingly, Chitwan was considered most suitable for such a 'model pilot project'. Plans for total control of the Rapti watershed had been conceptualized earlier (see above) and it was the only Terai district with a motorable road to Kathmandu, enabling foreign experts and engineers to tour, inspect and show the area. As the irrigation master plan noted: 'As the year-round irrigation farming should be a new target of agricultural development in Nepal, it is necessary to establish one or more model projects in which the engineers, technicians and leading farmers are to be trained first. In this context, the Chituan project (...) should be taken up and implemented as the pilot [project] to realize and practice *the epochal development of agriculture and irrigation* in this country' (emphasis added) (HMG-N, 1970b: S.3).

The ‘Chituan project’ or ‘Chituan valley project’ came out of the ‘Lothar irrigation project’, conceived in the late 1950s under the RVDP for the eastern part of the valley (DIDW, 1967; ADB/Agrar, 1972). In the irrigation master plan, the project was conceptualized with a dam in the Rapti river and a canal of 37 kilometres to supply water to all farmland in the district (HMG-N, 1970b: 42). Previously, such plans were considered financially unfeasible but now, with the entry of resourceful donors in Nepal (WB, ADB), the government had the opportunity to embark on irrigation infrastructure development as reflected in the fourth five-year plan of the government (1970-75) and the set-up of the irrigation master plan (HMG-N, 1970a; 1970b). In 1971, the government of Nepal officially requested the ADB for assistance with the implementation of the project, and one year later, in 1972, consultants from Germany (Agrar- und Hydrotechnik GMBH), contracted by the ADB, started their studies for a scheme that came to be known as the ‘Chitwan Valley Development Project’ (CVDP) (HMG-N/ADB, 1972; ADB/Agrar, 1972; ADB, 1972; 1977; 1990). In accordance with the irrigation master plan and the concept of year-round irrigation, the ADB and the German consultants envisioned a radical transformation of culture and society in Chitwan. They designed the CVDP as a regional, multipurpose development project with an ‘independent’ development board (established in 1973), meant to ‘*transform* the prevailing traditional agriculture of the project area to modern agriculture by *first* providing year-round irrigation’ (emphasis added) (ADB/Agrar, 1972: VI-3). The project was meant to touch upon all aspects of agricultural life, from the introduction of ‘multi-cropping’ practices and scientific ‘livestock operations’ to the organisation of farmers into ‘irrigation associations’ to streamline irrigation management at the tertiary level (for areas of 100 ha). With these characteristics, it suggests that the CVDP, as its predecessor RVDP, carried on to be a high-modernist version of a ‘TVA in Nepal’.

The ADB and German consultants worked hard to elaborate on the model function of the project (see Figure 7.16 for an impression). This was not an easy job. Investigations revealed that the available river resources in Chitwan, characterized by peak discharges in the monsoon, were insufficient for year-round gravity irrigation. Even the Rapti river, first seen as a suitable perennial source of water, was found to be unfavourable for the exploitation of water resources due to its meandering, gravel-filled riverbeds. Groundwater resources were discarded due to perceived heavy seasonal fluctuations in the water table (ADB/Agrar, 1972). In this context, the German consultants concluded that ‘year-round irrigation (...) can be achieved *only* by pumping from the abundant Narayani water resources’ (emphasis added) (ADB/Agrar, 1972: X-13). Based on the idea of lifting water into a canal system, a plan was worked out for three irrigation sub-projects in Chitwan: (1) the Narayani project (12.840 ha), lifting water from the Narayani to irrigate the land in West Chitwan and supplement the Khageri canal system for year-round irrigation; and (2) the Lothar (1.900 ha) and (3) Panchakanya (600 ha) projects in East Chitwan, using local river resources (ADB/Agrar, 1972). The originally conceived 24.000 ha was cut down to about 14.000 ha (including KIS) but the scheme was still believed to be an excellent model for Nepal, particularly the Narayani project. As the ADB (1972) noted: 'The Project *itself* has great significance to Nepal, as it is the first pump irrigation scheme in the country, and, as such (...) a model that could be duplicated in other areas, particularly in the Hill region where gravity irrigation is not practicable' (emphasis added) (p.57).

The CVDP or the Chitwan Irrigation Project (CIP) as it became known (over 80% of the budget was allocated for civil works and engineering services), made many aspirations of Nepalese irrigation engineers come true (see Figure 7.17 for an impression). The project allowed them to embark on serious infrastructure development, it legitimized the expansion of the national irrigation bureaucracy (the DIHM), and provided opportunities for Nepalese officials to work extensively with foreign experts and consultants, boosting the performance of the Irrigation Engineer. More specifically, project implementation was to take seven years (1974-1979), the 'Chitwan Project Office' foresaw 9 positions for engineers plus 19 for technicians and overseers, and the ADB stipulated 260 man-months for expatriate consultants (ADB/Agrar, 1972). Before the project, the Bharatpur irrigation office in Chitwan had (only) one engineer and 3 overseers (ADB, 1972). By this time, B.K. Pradhan had become the director general of the DIHM, signing contracts with the ADB and consultants in relation to the CVDP (DIHM, 1974). Together with N.K. Agrawal, they were key performers at national and international seminars on irrigation and water resources development in Nepal, talking about state interventions (B.K. Pradhan, 1974; Agrawal, 1976; Agrawal and Agrawal, 1976; HMG-N/FAO, 1976; APROSC/ADC, 1978; HMG-N/ADC, 1983). The CIP also provided career opportunities for a new generation of irrigation engineers like Som Nath Poudel. He was project engineer in the period 1984-1986 and later he acted as the director general of the DIHM (Poudel, 1986; 2009).

Figure 7.16: A shared experience of irrigation modernisation in Chitwan in the 1970s



Source: ADB, 1972.

Figure 7.17: Masculinities in the construction of the CIP project in 1978

31 August 1978: Chitwan Irrigation Project, main canal under construction. A typical feature of the photo is that it only shows infrastructure, the (control of) technology itself signifying a new world order. The photo also reflects international presentations of modern irrigation development (see for instance FAO, 1973), displaying high modernist (Western) standards for technology and 'mankind'. Obtained from the DOI divisional office, Chitwan District.

25 July 1978: Chitwan Irrigation Project, pump section. A photo of engineers and experts in control of technology [note the centrality of equipment in the group picture]. From left to right (front row): a mechanical overseer (male, Madhesi), project engineer Gokul Lal Amatya (male, Parbatiya), a consultant (female, from the West, perhaps from Germany), and a mechanical engineer (male, Newar). The gender and background of the persons reveals intersections with class, caste, nationality, professional discipline and institutional affiliation. Obtained from the DOI divisional office, Chitwan.

Figure 7.18: Masculinities in irrigation system performance in the 1980s

1985: Silt in the canal system of Narayani Lift Irrigation System (then still known as Chitwan Irrigation Project). These photos were taken by an Indian consultant who was contracted to study the problem of silt in the canal system. The pictures can be seen to represent one of the many problems that engineers encounter in the implementation of technology and the construction of irrigation systems. The pictures also show the solution that engineers found to deal with the problem, presenting silt in the canal as a 'technicality' that can be solved with machines (a bulldozer). As photos of technical problems and solutions, they (also) can be seen to re-invigorate masculinities of the irrigation engineer as a 'can do' person. Reproduced from Jyoti, 1985: photo number 17 and 18.

Figure 7.19: Masculinities in irrigation system performance in the 1990s

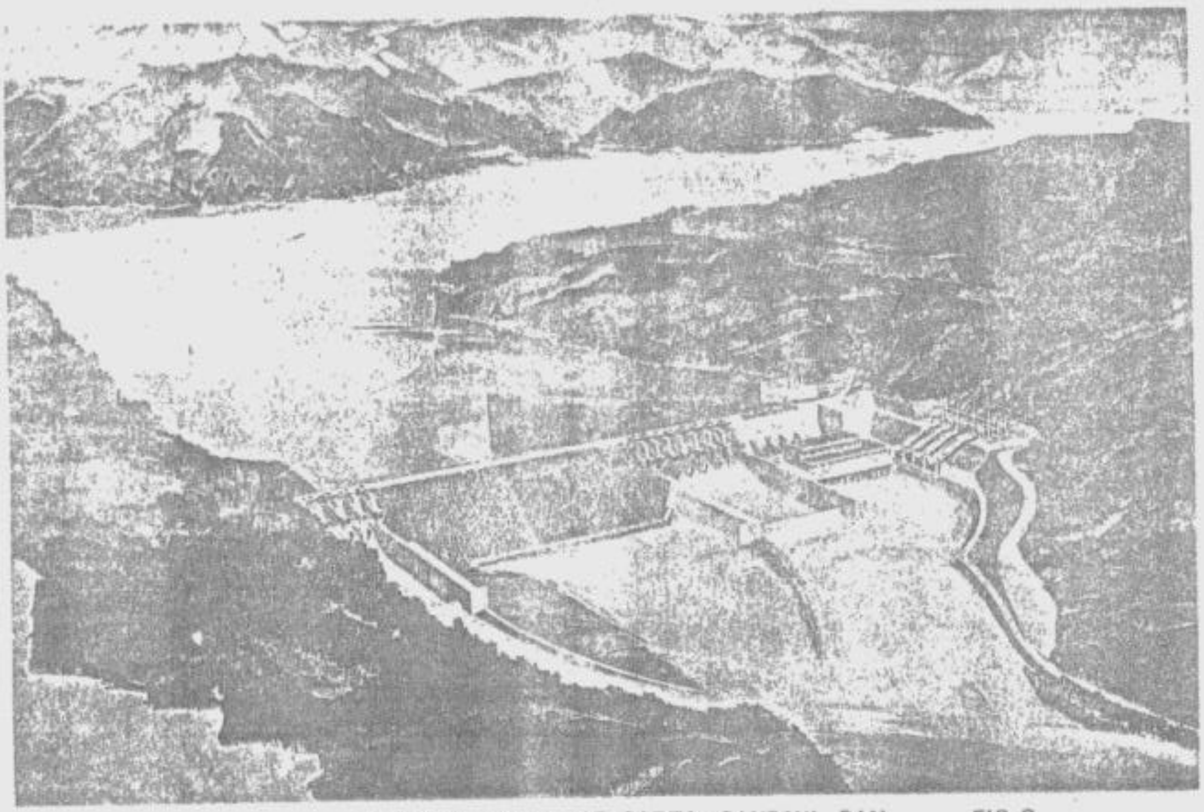
∨ **Mid-1990s:** Narayani Lift Irrigation System, main canal between pump house A and B. A typical feature of the photo is the centrality of the canal and water flow, signifying the capacity of engineers to control (huge) water flows and build functioning irrigation systems. Obtained from the DOI office, Chitwan District, 2011.

> **Mid-1990s:** Narayani Lift Irrigation System, Pump house A. This can be considered a typical image of masculinities in engineering, showing pumps and machines, their size expressing power, strength and robustness (qualities that are associated with masculinities). Obtained from the DOI office, Chitwan District, 2011.

The ‘epochal development of agriculture and irrigation’ that the CIP was envisioned to achieve translated into some difficult situations in implementation. Problems were there from the start like delayed negotiations with consultants, bidding problems with contractors and devaluation of the US dollar. The project required two supplementary loans from the ADB in 1977 and 1984, it was downsized significantly and eventually implemented between 1977 and 1989 (ADB, 1977; 1990). However, the real shock came in 1983 and 1984 when the pumps were operated for the first time. Due to the high suspended sediment load of the Narayani river in the monsoon, the canal system clogged up with silt and pumps broke down (see Figure 7.18). By early 1985, more than 30.000 m^3 of fine silt had been removed – the capacity of the main canal in Figure 7.18 is just 7.000 m^3 – and the first pump parts were replaced (Jyoti, 1985; Rothwell, 1985). A review of project documents reveals that the high sediment load of the Narayani river was anticipated but also marginalized from the start. Agrar- und Hydrotechnik noted in 1972 that the ‘sediment transport [read: regime] appears to be balanced’ in the river (ADB/Agrar, 1972: X-17). Saliently, a main tributary of the Narayani is the Seti river, meaning ‘white river’, referring to the fine white silt that it carries. The request of Jyoti Limited for time to investigate the matter in 1977, based on their experience with Indian rivers was denied as the project was already behind schedule (Jyoti, 1985). This reads as part of ‘normal’ project dynamics, shaped by pressures to spend allocated budgets and meet construction targets, but it proved to be a capital mistake.

In 1985, an ADB consultant calculated that the turbidity level was six times higher than foreseen, concluding that the system had to cope with 57.000 m^3 of silt annually if no measures were taken (Rothwell, 1985). Various remedial works were proposed (sand trap, redesign intake, replace pumps, install sludge pump) but only partially executed. A reason was also that the system had come to face a monumental electricity bill. From a projected 0,12 NRS/kWh in 1972 to 2,20 NRS/kWh in 1988 and 3,05 NRS/kWh in 1991 (ADB, 1972; WECS/Earth, 1995). Originally, Narayani Lift Irrigation System (NLIS), as the system became known, had been projected to benefit from the ADB-supported Gandak-Hetauda Power Project that was implemented at the same time, creating a win-win solution of cheap electricity and cheap irrigation (ADB, 1972). However, by the time of project completion, around 1990, the government concluded that it should give up lift irrigation and opt for gravity flow schemes because operation proved to be very costly in the long run (DOI, 1992). The NLIS mainly pumped sand at completion, supplying a meagre 2.900 ha with supplementary irrigation in the monsoon (ADB, 1990). In the 1980s, the NLIS became a textbook example in Nepal of unproductive high cost state irrigation development in Nepal, a very inconvenient situation for the Irrigation Engineer. Today the system is operated for some areas in the monsoon (see Figure 7.19), mainly under pressure of farmers, and DOI engineers talk about the system as a ‘white elephant’ – expensive but hard to operate (field notes, 20-6-2011). Perhaps the construction of a flood protection embankment and the Panchakanya project in East Chitwan were the most successful components of the CVDP (ADB, 1990; Neupane and Prasad, 1997). The projected 600 ha for Panchakanya was never fully serviced, but the command area was expanded from about 100 ha to 375 ha (see Khanal, 2003 for a detailed account).

Figure 7.20: An artistic view of what engineers can do



ARTISTIC VIEW OF SAPTA-GANDAKI DAM FIG. 9

1985: A view of the Sapta Gandaki dam in the Narayani river. The image is a classical 'masculine' construction of 'taming nature' and engineering prowess: the show of a 'mighty' river that flows from the mountains, being controlled and put into use by a strong, robust and powerful dam. Reproduced from MOWR, 1985.

In the background of the implementation of CIP, water resources planning in relation to Chitwan District continued in the 1970s and 80s. One of the key projects that was being developed under the MOWR was the Sapta Gandaki project in the Gandaki (or Narayani) river (see Figure 7.20 for an artistic impression). Along with other dams in the Himalayan rivers, this dam (60 meters high) was meant for hydropower generation (225 MW) and irrigation supply in Chitwan district (19.000 ha). Eventually, this project was not executed, being pushed aside by the political contestations that surrounded Arun-3 (see Gyawali, 2009: 308), a major dam and multipurpose project in the Kosi basin. The language in two promotion booklets of the MOWR in the 1980s, in which the Sapta Gandaki and other projects were presented, suggests that a classic version of the hydraulic mission in Nepal was at its height.

The booklets dramatized '[t]he Himalayan Watershed [as] one of the world's last great frontiers of development' (MOWR, 1985: 4), quoting king Birendra saying that 'water (...) if harnessed (...) properly holds *a magic key* for all-round development of our country' (emphasis added) (MOWR, 1981), and stating that 'the myriad Nepali rivers that thunder through the Himalayan gorges dissipating their fury and wreaking havoc (...) should be tamed through (...) engineering efforts to bring prosperity to the people' (MOWR, 1985: 1).

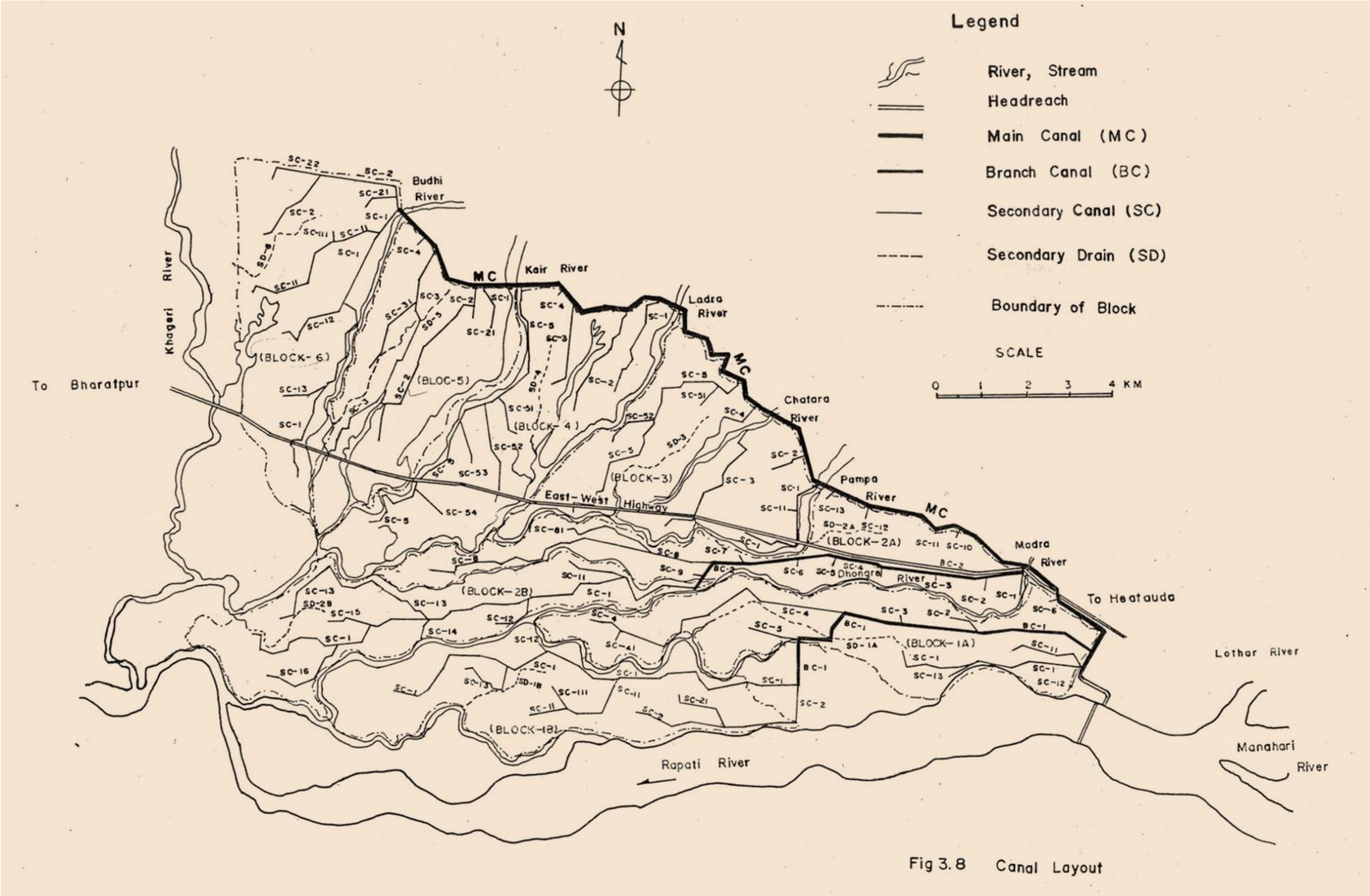
7.6.3 East Rapti Irrigation Project (1990s)

The CIP also experienced set-backs with the implementation of the Lothar scheme, the project for irrigation in East Chitwan. Implementation was delayed time and again, and the project was eventually included in 1986 under a new loan of the ADB for the East Rapti Irrigation Project (ERIP) (DIHM/ADB/Nippon Koei, 1985; ADB, 1990). An important reason for the delay were 'existing irrigation facilities' in the area (ADB/Multi, 1986: 6). The appraisal report for the CVDP had noted 'small fragile farmer-built irrigation systems' but considered that 'farmer built intakes [give] flood waters entrance to (...) farm lands with (...) erosion and (...) fragmentation of land' as a result (ADB, 1972: 17). Therefore, it was proposed to arrange 'compensation of farmers whose private schemes are going to be *eliminated*' (emphasis added) (ADB/Agrar, 1972: XI-1). This quote suggests that the systems were illegible for engineers because the intakes washed away and also, that they had no value for them because it was believed, the systems could not support year-round irrigation. This view changed in the 1980s. In 1982, the foreign resident engineer of Agrar-und Hydrotechnik recommended to improve the 'intensive small irrigation systems already functioning under local management' (note the different wording) (Adams, 1982: 1). He proposed to link the schemes, utilize the existing canal networks as much as possible, and supplement the systems with water from the Rapti river by means of a diversion dam. Not surprisingly, he identified the Budhi Rapti area, the heartland of Tharu agriculture and irrigation, as the most valuable area. Also Nepalese engineers came to view things differently. In 1985, the WECS commissioned a 'water resources inventory study' for the Terai, reporting no less than 81 'village operated irrigation systems' in the district of which 35 were located in East Chitwan (WECS/CEMAT, 1985).

In spite of these developments, the ERIP project continued to be seen as 'one of the few remaining large-scale irrigation projects [in Nepal] that could provide year-round irrigation facility' (DOI/Nippon Koei/Silt, 1990: xvii) (see Figure 7.21 below for a layout of the canal system). In a nutshell, this is what the COP of the Irrigation Organisation and the performance of the Irrigation Engineer was then about. ADB missions of Western and Asian experts conceptualized the project, foreign engineering consultants did the detailed design (Nippon Koei Limited, Japan), engineers of the DIHM represented the government and Nepalese engineering consultants did the data collection and field studies (ADB, 1987a; 1987b; DOI/Nippon Koei, 1989; DOI/Nippon Koei/Silt, 1990). Illustratively, the ADB proposed that the project fall under the CVDP, and the focus of the project was the construction of a dam in the Rapti river (370 meter wide, 2,6 meter high) and a main canal of 24 kilometres to irrigate 9.500 ha of land (ADB, 1987a). The only difference with previous practice was an emphasis on the collection of the so-called Irrigation Service Fees (ISF) and the establishment of so-called Water User Groups (WUG). The implementation of ISF was a new (working) policy (after 1986) that was being tested and introduced to assure cost-recovery for the government. The set-up of WUGs also was new policy (initiated in 1982) designed to assure and increase farmers' participation in the operation and maintenance of the system (Pant, 2000; Khanal, 2003). Apart from these objectives, it was business as usual, yet it was not to happen.

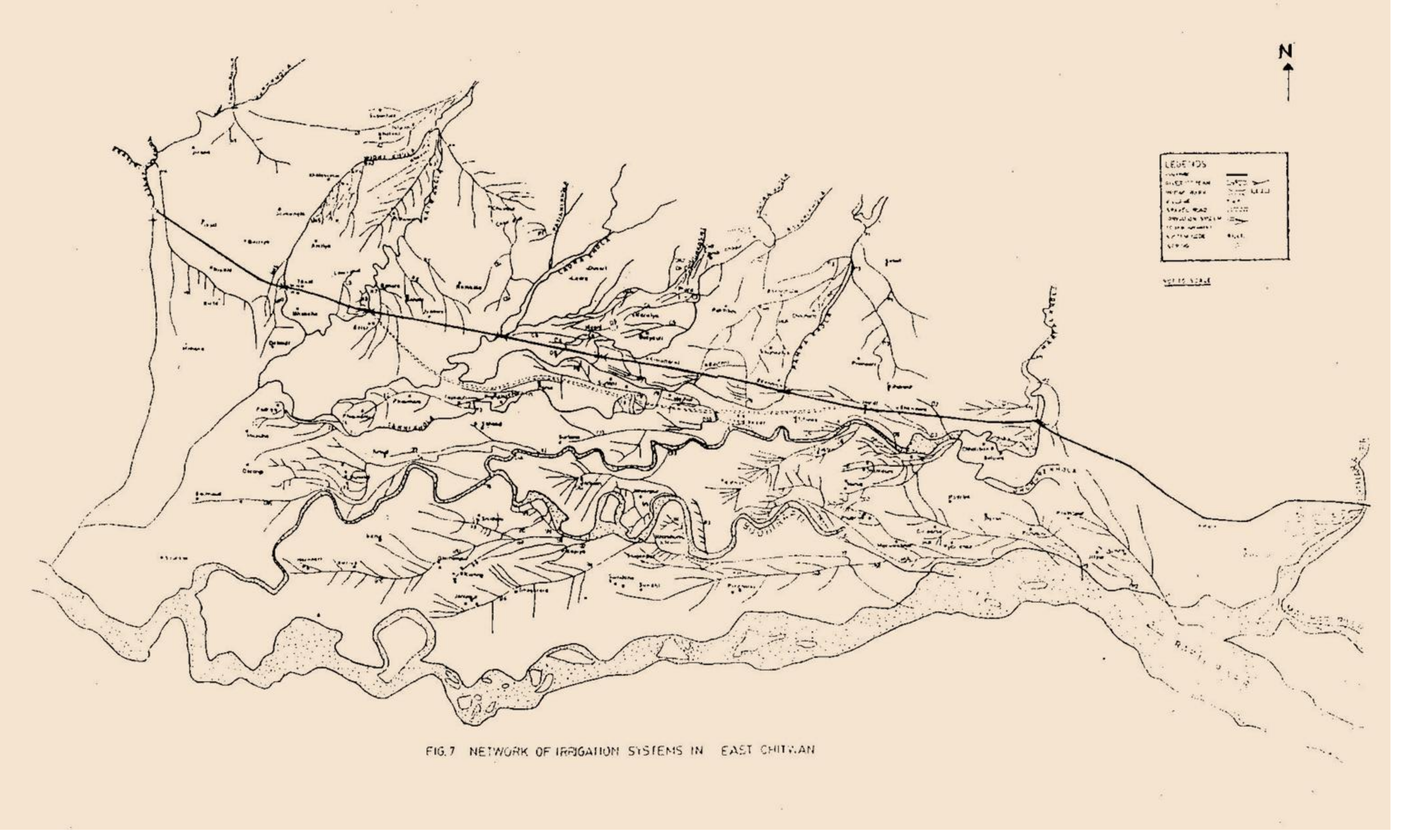
The ERIP project became a site of controversy in relation to irrigation policy, professional expertise and engineering performances. At first, the project was criticized for its (civil) engineering focus and the neglect of existing irrigation practices in East Chitwan (Khatri-Chhetri *et al*., 1988; Shivakoti *et al*., 1997). The critique reflected a larger international trend in irrigation and did not just concern the project itself or the DOI and Nepal in particular. It was importantly directed at the COP of the Irrigation Organization and its member organisations, which continued focussing on 'building things' (Coward *et al*., 1982 criticized national irrigation agencies and foreign donor groups). The critique was shaped in research on farmer-oriented processes in rural development and irrigation, focussing on communication between public agencies and farmer groups, and in joint investigations on new technology and management options (see for a selection of early work in Nepal and elsewhere: P. Pradhan, 1980; 1989; Botrall, 1981; Uphoff, 1982; 1986; Martin and Yoder, 1983; 1988; Long, 1984). Key actors in these debates were researchers of Cornell University, an interdisciplinary group of agricultural engineers and specialists, economists, sociologists and anthropologists (see Levine, 1992; 2013 for a background on the Cornell irrigation programme). In the 1980s, they toured Asia to explain their insights and elaborate on new knowledge in irrigation. Some of their names (Walt Coward, Gilbert Levine, Norman Uphoff) and their students (Edward Martin, Robert Yoder, John Ambler, Doug Vermillion) are still associated with irrigation studies in South Asia. After PhD graduation, they came to work for the IWMI (established in 1986) and the Ford Foundation (India), developing action-research programmes.

Figure 7.21: The enactment of an experience of irrigation development in 1989



Source: DOI/Nippon Koei, 1989

Figure 7.22: The enactment of an alternative experience in irrigation in Chitwan in 1993



Source: Shukla *et al*., 1993

Nepal and Nepalese researchers had a prominent role in these debates. Martin (1986) and Yoder (1986) did their PhD studies on farmer irrigation in Nepal, working together with Nepalese social scientists, notably Prachanda Pradhan and Ujiwal Pradhan, visiting scholar and PhD fellow at Cornell respectively (U. Pradhan, 1988). In 1983, in an international conference on 'water management issues' in Kathmandu, Nepal was put 'on the map' as an important place for research (HMG-N/ADC, 1983). Levine, Martin, Yoder and P. Pradhan acted as key speakers in the conference alongside chief engineers of the DHIM and WECS and top administrators of the NPC. To illustrate, B.K. Pradhan and N.K. Agrawal interacted in the debates (then secretaries of WECS), the director general of the DIHM presented a paper and the irrigation chiefs of all major projects in Nepal were there, including Amatya Gokul Lal, then project engineer of the CIP. There also were other members in the COP of the Irrigation Organisation participating in the conference, such as a managing director of a construction company, Nepalese and foreign engineering consultants and a representative of the ADB. Also Uphoff and Robert Chambers (then Ford Foundation) were there, as well as members of international (aid) organisations (UN, FAO, USAID, SNV) (see HMG-N/ADC, 1983: 247-255 for a list). In short, there was a commitment among actors to reflect on the problems that plagued state irrigation development such as described above for the CIP.

The topic that particularly raised awareness was the capacity of farmers in Nepal to organise their own resources in irrigation and manage systems without (much) state involvement, based on informal rules and collective action – in systems that came to be known as 'FMIS' (Martin and Yoder, 1983; see also Ostrom, 1992). In the years thereafter, many FMIS systems were studied with the goal to redefine irrigation intervention programmes and develop policies of PIM. The Ford Foundation made grants available for Nepalese fellows at Cornell and the set-up the IIMI in 1984 (now IWMI; see IIMI, 1986 for a background on the organisation). IIMI started operations in 1986 with an action-research programme in Nepal on FMIS, in collaboration with WECS (IIMI/WECS, 1987). Two resident researchers were appointed to build a network (Yoder and P. Pradhan). In this capacity, they acted as influential policy actors, having direct access to the 'sector coordination meeting on irrigation' of 1988, held to prepare a new master plan for irrigation development in Nepal and define new 'basic needs' policies for the irrigation sector (Yoder *et al*., 1988; HMG-N, 1988).

Another important development in Nepal was the start of the earlier mentioned USAID-supported IMP project (1986-1994) (see Chapter 2), in which engineers of the DIHM were more directly involved. This project focussed on investigating new management options for state irrigation systems, also known as Agency Managed Irrigation Systems (AMIS) (Khanal, 2003). The focus was on exploring a new policy to hand over (part) of the management responsibility of state irrigation systems to WUAs, test an approach to work with association organisers (AO) in irrigation (Gautam, 1989; 1990) (see Chapter 2), and train agency personnel and farmers in the Irrigation Management Centre (IMC) (Pant, 2000). These debates and action-research projects provided the basis for a new Irrigation Policy in 1992 and a new Water Resources Act in 1992 (see Khanal, 2003: 43). The IMP project provided career opportunities to a new generation of DOI engineers like Suman Sijapati. He returned to Nepal in 1986 from Roorkee College with a BE civil engineering and was assigned a post in the IMP from 1987-1990, working at the IMC to train farmers. Later, he would become the chief of the 'Water Management Branch' in the DOI (from 2002 to 2008), keeping an interest in farmer's issues in irrigation management (Sijapati and Prasad, 1998 Sijapati and Sharma, 2008). Today he also acts as the chairman of the INPIM-network in Nepal.

In this background, Chitwan became a key area of 'indigenous' FMIS research in Nepal, unique and a part from the iconic cases of FMIS studied by the Cornell researchers – Argali and Cherlung in the Hills and Chhatis Mauja in the Terai (Martin and Yoder, 1983; 1988; P. Pradhan, 1984; 1989). With the IAAS situated in Chitwan, Rampur, the district become a model for Nepal again, this time for the development of a new style of public intervention in irrigation – the rehabilitation of FMIS (IIMI/WECS, 1987). In 1986, the IAAS established an interdisciplinary 'Irrigation Management Systems Study Group' (IMSSG) among its faculty to study emerging issues in irrigation. IIMI provided seed money for this group (IIMI/IAAS/Winrock, 1988). The IMSSG consisted of professionals with backgrounds in agronomy, soil science, agricultural engineering, agricultural economics and agricultural extension (Khatri-Chhetri *et al*., 1988). The activities of the study group were framed in the background of the problems in the CIP and the newly planned ERIP, based on the argument that information on existing irrigation systems was incomplete (IIMI/IAAS/Winrock, 1988). The group undertook an inventory study of existing irrigation systems in East Chitwan.

The first results of the group produced many issues for debate. The IMSSG had documented the Budhi Rapti area, a place where irrigation systems were known to exist and the river was called *amrit khola* ('life-saving river'). In this area, the FIWUD and MPLD were assisting various FMIS systems to improve water utilization through infrastructure development. The findings were beyond expectations, even for the members of IMSSG. Although the study did not explicitly recognize the Tharu as important irrigators, writing that 'the new settlers were more willing to adapt new technologies and (...) were more advanced and cooperative [than the Tharu and Darai]' (Khatri-Chhetri *et al*., 1988: 4), perhaps because of the upper-caste status of faculty staff of IAAS themselves, it found eleven 'independent' irrigation systems on the Budhi Rapti river, providing year-round irrigation to an area of 1.200 ha.[72] To recall, this was (and is) the heartland of Tharu area in Chitwan and some of the systems under study were over 100 years old. It was observed that 'the performance of the systems has been *excellent*'

[72] Later it was recognized that the Tharu and Darai were 'the pioneers of FMIS development in the valley' (see Shivakoti *et al*., 1997: 150).

(emphasis added) (Khatri-Chhetri *et al*., 1988: 8). Reportedly, cropping intensities ranged over 300 percent, and the estimated yields were high (between 4.0 to 6.0 ton/ha of paddy in the spring season). In 1987, the IAAS, in collaboration with IIMI and Winrock International, organized a national seminar in Rampur on 'irrigation management in Nepal'. Farmers from the area were invited and the talk was mainly on the envisioned ERIP-project area (Figure 7.22 presents a map that was made by the IMSSG group to show the network of existing canal systems in East Chitwan – a map to 'counter' the map of the DOI and Japanese consultants).

Figure 7.23: The professional performances of researchers in irrigation

1993: Members of the Irrigation Management Systems Study Group at IAAS campus, Rampur. From left to right: Dev Nath Yadav (male, Madhesi), Mr. Sakya (male, Newar), Ashutosh Shukla (programme coordinator, male, Madhesi); Ganesh Shivakoti (male, Parbatiya), [unidentified person], Elinor Ostrom (female, American). The gender and background of the persons reveal intersections with class, caste, nationality, professional discipline and institutional affiliation. Saliently, the performance of these professionals in irrigation appears 'less masculine' because they is no show of technology in the photo. Obtained from the IAAS campus, Rampur, Chitwan, 2011.

The IMSSG became a very active group in Nepal (1986-2002), collaborating with IIMI, the UNDP, the Ford Foundation, Winrock International, Indiana University and the Workshop of Political Theory and Policy Analysis (Elinor Ostrom), and researchers from Cornell and Wageningen University (see Figure 7.23).[73] It did research on water rights and conflicts, documented processes of irrigation management transfer (IMT), worked on curriculum

[73] I have a history available on the IMSSG. It is not included in this thesis.

development, and played a role in 1998 in the establishment of the Nepal chapter of the INPIM/N and the National Federation of Irrigation Water User Associations Nepal (NFIWUAN) (U. Pradhan *et al.*, 1992; Benjamin *et al.*, 1994; Shivakoti, 1994; R. Pradhan *et al.*, 1997). In this capacity, the researchers of IMSSG were having a say in policy and projects in the irrigation sector. In collaboration with the DOI, the studies on FMIS systems in East Chtiwan had a direct impact on the design of the ERIP project (Khatri-Chhetri *et al*., 1988; Shukla *et al*., 1993; 1997; Poudel *et al*., 1996; Shivakoti *et al*., 1997). In 1989, the ADB came to review the project in view of the existing irrigation facilities in the area. Key to the review was a detailed inventory of existing farmers' irrigation schemes in East Chitwan (DOI/Nippon Koei/Silt, 1990). This survey found 85 irrigation systems in the area, over 340 'permanent' canal structures (mainly siphons and aqueducts), about 133 m/ha developed canal systems (compared to 55 m/ha in project design), and many informal farmer groups operating the system. At the same time, the reviewed plan insisted on building a dam and new canal infrastructure. Eventually, it was the foreseen adverse environmental impacts on Chitwan National Park that made the ADB conclude in 1991 to suspend the project – not necessarily the existing irrigation systems (Poudel *et al*., 1996; Shivakoti *et al*., 1997). In this context, the ERIP was redesigned as a project for the rehabilitation of existing FMIS systems in the area.

The project was executed in the period 1993-1998 and focussed on the rehabilitation of 86 FMIS systems (Shivakoti *et al*., 1997; DOI/GEOCE, 1998). The ERIP became a testing ground in Nepal to explore and test new project implementation approaches. The IMSSG group assisted the DOI with 'process documentation research' (PDR). Following the new irrigation policy (1992), WUAs were institutionalized, registered with the District Water Resources Committee and organized under a newly set-up East Chitwan Water Users Coordination Committee (ECWUCC), giving farmers a formal vote in project matters. A study of IMMSG researchers in 1997 concluded that ERIP had been 'effective and fruitful' (Upreti *et al*., 2002: no page number mentioned), reporting a substantial increase in irrigated area (more area irrigated for two seasons, more areas having access to monsoon irrigation), stabilized or increased (rice) yields and an overall positive response from farmers.

The 'demand driven' procedure for project selection and implementation, as tested in ERIP (Shivakoti *et al*., 1997: 133), in which farmers are expected to approach the DOI office (or other government authority like the VDC, DDC or DA), request assistance and submit this in writing, is in place to date. I observed that WUAs also are now involved in the selection of contractors to assure quality of implementation (see Figure 1.4, photo 1 in Chapter 1; it shows a member of the WUA, holding a big umbrella, monitoring construction works of a contractor who was selected by the WUA). To date, as in ERIP, overseers and engineers of the DOI play an active role in the demand-driven approach. They notify or approach farmers for new project opportunities and help them formalize a request. This is then sent, through the DDC or directly, to the DOI headquarters in Kathmandu for approval. As in ERIP, the main role of the DOI in this process is (still) the concrete-cement lining of canals in FMIS systems and participation in WUAs is mainly recognized by farmers as a means to secure support from the government whenever an opportunity arises – not primarily as a means to manage the system. This is not new. Already in 1998, upon completion of the project, an ADB mission felt the need to launch a 'WUAs revitalization campaign' (DOI/GEOCE, 1998: 6). Engineering consultants were then contracted for the job (GEOCE Consultants) and members of 77 WUAs received training. Formally, many of these WUAs are (still) in place and also the ECWUCC is used whenever it is deemed opportune by farmers (field observations, 2009-2011). In 2008, the ECWUCC, now representing 104 WUAs, submitted a written request at the DOI office in Chitwan for a new hydraulic excavator, to repair diversion weirs of the systems and feeder canals in the river beds. Annual maintenance is required and there also had been heavy floods in 2003 and 2004. The request noted '[a]lthough [the ECWUCC] is active and trying to improve condition[s] of [the] system[s], without proper external support, it seems very difficult to run [the] system[s] in a reliable manner' (ECWUCC, 2008: 1). The request was prepared with help of DOI staff and acknowledged with a cover letter of the then chief engineer of Chitwan District, Ram Prasad Adhikari.

The ERIP project provided a reflexive learning experience for DOI engineers. The project was executed from the 'East Chitwan Irrigation Office' (Tandi Bazaar), set-up for the time span of ERIP. Two of its chief engineers were Babu Ram Adhikari (before 1998) and Purushottam Kr. Shahi (in 1998) (Shivakoti *et al*., 1997: 140; DOI/GEOCE, 1998: Annex II) (Their names are not in the list of Annex 55 because they were heading a separate office). From a gender perspective, two other issues are worth mentioning. The documentation of the ERIP project by IMSSG made visible for the first time, for a larger audience of development practitioners, that the impact of 'development' in Chitwan was experienced differently by the Tharu people and (upper-caste) hill migrants. For instance, it noted that hill migrants since the 1950s had constructed new systems but also, that they had taken over the control in many FMIS systems in East Chitwan; out of the 88 systems that were studied, 45 were controlled by migrant farmers, 33 by Tharu and 33 were managed by Tharu and migrant farmers (Upreti *et al*., 2002). Also worth noting is that 30% of the participants in the above mentioned WUAs revitalization campaign, were reported to be female members of WUAs. For instance, it was noted that 410 out of 1.323 WUA officials who were trained in 1998 between September 12 and November 24, were women (DOI/GEOCE, 1998: Annex I). High women participation in the WUA also was reported then in Panchakanya (Singh *et al*., 2014: 166). The Irrigation Policy of 1992 stipulates that 33% of the members of WUA should be women and WID policy attention was high (see Chapter 2). In Panchakanya, women's involvement was the result of the active involvement of an ADB-funded NGO (Khanal, 2003), but in 2010, it was found that women's participation in the WUA has waned (Singh *et al*., 2014). This also appears the case in WUAs elsewhere in Chitwan District (field observations, 2009-2011).

7.6.4 Irrigation Management Transfer Project (1990s and after)

In the background of the above described processes, Chitwan also became a place in Nepal to explore and test new project management approaches for state irrigation or AMIS systems (Khanal, 2003; Singh *et al*., 2014). The Irrigation Policy of 1992 also introduced an IMT policy, explored in Nepal under the IMP project (see above). The IMTP project, implemented between 1995-2002, was the first programme in Nepal that was to achieve initially, partial and then complete 'transfer' of institutional responsibilities from government agencies to WUAs. Among the first 11 irrigation projects in Nepal selected by the DOI for handover to farmer user committees, were Khageri (3.900 ha) and Panchakanya (600 ha). In Khageri, negotiations between the DOI and farmers had already started in 1992 and in Panchakanya, an informal irrigators group had already been established as early as 1987 (Khanal, 2003). A joint management between the government and the farmers was identified for Khageri, mainly because the system was large and expected maintenance cost high. Prior to transfer both systems were rehabilitated by the DOI. This was a common practice in most of these early cases of transfer, because it was realized that farmers otherwise felt that the government was trying to overload public responsibility upon them (Khanal, 2003: 133; see also Suhardiman and Mollinga, 2012 for Indonesia). In Khageri, a formally established WUA signed a memorandum of agreement for joint management with the DOI in 1996 and in Panchakanya, negotiations on handover between the informal group and the DOI started in 1994 and ended in 1998, when the system was officially fully transferred to a newly established formal WUA. Also in this project, IMSSG was involved in PDR (Shukla *et al*., 2000; Adhikari *et al*., 2002). The pilot status earned the systems international recognition and in the 1990s, when policy faith in IMT/PIM was high, farmers' participation in Khageri and Panchakanya was considered exemplary for the IMT programme in Nepal (Singh *et al*., 2014).

Parallel to IMTP interventions in Chitwan, negotiations also took place between farmer leaders of NLIS and the DOI (see Figure 7.24).[74] In this system, farmers had already organised themselves in branch level committees. In 1993, in the onset of the monsoon season, pump propellers broke down again and water service delivery stopped. Under political pressure of farmers (the car of prime minister G.P. Koirala was blocked on the road in a visit to Chitwan District and farmers' delegations went to the DOI and the Minister of Water Resources in Kathmandu), the government promised funds for rehabilitation on the condition that a formal

[74] An overview of the course of events in NLIS (1978-2010) is available from the author, based on interviews with the past and present leaders of the WUA and e-mail communication with the chief engineer of the DOI in Chitwan, Puspa Raj Khanal (1994-1997).

WUA was established and a memorandum of agreement was signed with the DOI for joint management. The process followed thus the same approach as in Khageri and Panchakanya. An agreement was eventually reached in 1995. The DOI remained responsible for the pump houses. The cost of maintenance of the main canals (A, B and C) was to be shared between the DOI (74%) and the WUA (26%). The ISF was increased in 1995 from NRS 100/bigha to NRS 150/bigha and since then, it has been collected by the WUA and partially channelled to the DOI.[75] Contestations between the DOI and farmers on responsibilities remained however. In 1996, the WUA only contributed 10% of the maintenance cost of canal B and C and re-negotiations followed. Around 2001, about 75% of the projected ISF target was collected by the WUA but since then, it has gone down to around 50%. In 2004, the ISF went up to NRS 225/bigha and a new cost-sharing arrangement was negotiated between the DOI (80%) and the WUA (20%). By the time of research in 2011, the DOI funded over 80% of the operation and maintenance cost and irrigation service was limited to a selected area in the monsoon and occasionally, to some small area in the spring season. The DOI also was in the process of a new assessment of the system. An increasingly larger part of the command area was converted to housing areas as a result of city expansion of Bharatpur and the WUA had developed a practice of selling the annual supply of fine silt from the canals to contractors and construction companies.

The IMTP project and IMT policy had a big impact on personnel in the DOI. For engineers, it provided new career opportunities and it embodied a reflexive experience on professional practice. The then chief engineers of Chitwan, Achyut Man Singh, the last project engineer of CIP (1990-1994) and Puspa Raj Khanal, the first engineer in the new Narayani Lift Irrigation Office (1994-1997), had key positions in the negotiations, exploring new irrigation system management approaches. Khanal wrote a thesis on his insights (see Khanal, 2003). For lower-level personnel, it was a different issue. As a result of CIP project completion, the number of staff was reduced to 64 from more than 250 persons (Khanal, 2003: 67). The remaining overseers and technical staff members were now expected to behave more as social organisers than as technicians and also, to work on relatively simple canal lining projects. These changes were hard to digest for some. The social organiser, institutionalized in the office in the early 1990s, obtained a low status in the DOI hierarchy, acting basically as an office assistant for paper work (field notes, 2009-2011). In May 2010, two overseers in Chitwan shared their frustration with me because they were already working for about 15 years on small construction jobs. Since the mid-1990s, after the conclusion of the ERIP and IMTP projects, DOI personnel in Chitwan has even further been downsized. In 2011, there were about 30 staff members employed. In contrast, for the politically astute farmer leaders, who had leading roles in the negotiation process, the WUAs form a new network of opportunities. As in East

[75] 1 bigha = 0,68 ha

Chitwan, it provided them with connections to the DOI, using the WUA to claim government resources and press forward requests for support and technical assistance (see the pictures in Figure 7.25: the Ministers of Irrigation visiting the district). One example is the continued pressure of Khageri farmers on the DOI to augment water supply in the system after IMTP completion. Shortage of water has been a recurrent concern in Khageri and in the mid-1990s, the DOI started investigating the possibility to lift water from the Budhi Rapti river in East Chitwan to increase supply to the main canal (DOI/Multi, 1997; DOI, 2000). An inception report was produced in 2001 for the 'Baghmara Lift Irrigation Project' (DOI/Manisha, 2001), but eventually it was cancelled due to environmental concerns (the intake would be located in the buffer zone of Chitwan National Park).

Events that also have changed performances of irrigation engineers and of other state agents in Chitwan are related to the Maoist insurgency in Nepal (1996-2006). Particularly in the period 2001-2005, it appears to have been difficult for engineers and overseers to engage in project work in the field (see also Regmi, 2004). It was hard for me to assess the impact of the conflict on professional performance in irrigation, but it certainly has left a mark in the farmer communities in Chitwan. Field work in Panchakanya Irrigation System suggests that agricultural yields have remained high and stable in the period 1998-2008 (around 4,6 ton/ha in the monsoon and 3,6 ton/ha for early paddy), but conflicts over key positions in the WUAs of Panchakanya and Khageri, between supports of Nepal Congress (NC), United Marxist Leninist (UML) and Maoist fractions, were reported (Liebrand and Singh, 2012). In Panchakanya, it also could be seen that contestations intersected with ethnic divides in society, the new chairman of the WUA in 2009, being a Maoist supporter and Tharu leader.

Figure 7.24: New performances of masculinity in irrigation in the 1990s

Mid-1990s: High-level DOI engineers attending an assembly of farmers (and later WUA of NLIS). From left to right: Shiva Shankar Mishra, Komal Prasad Regmi, Shyam Prasad Rajbhandari (IMTP Chief Engineer). Engineers no longer show (only) as construction bosses and holders of technical knowledge. New performances of masculinity appear to centre on the role of engineers as mediating chiefs [note the posture of the men, sitting behind a table, wearing sunglasses] who have come to listen to 'their' constituents (and make a decision). Photo obtained from the DOI office, Chitwan.

End-1990s/ start-2000s: The WUA of NLIS, newly elected. The Chief Engineer of the irrigation office in Chitwan District honours the new members of the WUA and gives 'his' blessings by putting tikkas on their heads. This can be seen as the staging of a traditional performance of a leader in the Terai, like a jimindar, who acts as a mediator between the people and the state, except that the farmers are no longer 'his' people and now act as politically astute agents. In Nepal, the one who gives tikkas is often senior, male or holder of a higher (ritual) status and authority. It is an act that bestows upon the one who gives the tikka a 'natural' performance of power. Photo from the DOI office, Chitwan.

Figure 7.25: New performances of masculinity in irrigation in the 2000s

± 2000: Minister of Irrigation visiting Chitwan District, Pump house A of Narayani Lift Irrigation System (NLIS). From left to right: Deepak Prakash Baskota (Minister of Irrigation); Chairman of the WUA of NLIS; Chairman of the WUA of Khageri Irrigation System (KIS). This and the photo on the left suggest that the latest professional performance of engineers is to act as men with big network capacities, 'bringing' high-level administrators to Chitwan and 'hosting' them in the district. Photo obtained from the DOI office, Chitwan, 2011.

± 2008: Minister of Irrigation visiting Chitwan District, Pump House A of Narayani Lift Irrigation System (NLIS). From left to right (front row): Secretary of the WUA of NLIS; Ram Prasad Adhikari (Chief Engineer of Chitwan); Chairman of the WUA of KIS; Bal Krishna Khand (Minister of Irrigation); bodyguard; technician of NLIS. Photo obtained from the DOI office, Chitwan, 2011.

As can be surmised from this account, the DOI became a different organisation in the last two decades. That having been said, the agency continues to see itself as a construction organisation (see Chapter 4 on the analysis of the questionnaire), and the basic working relations in the COP of the Irrigation Organisation are still in place. Donor groups set the terms for funding, the DOI identifies projects at high policy and field levels (through social organisers and the 'collection' of farmers' written requests), engineering consultants do the surveys, questionnaires on willingness of farmers to participate and proposals for post-construction system management, and contractors get to do the construction work. In these working relations, there are some very strong normal professional reflexes at work, as Chambers (1988) calls it. To illustrate, the DOI is keen to stay in control of project selection and in anticipation of the Local Decentralization Act of 2000, which empowered DDCs and VDCs to control natural resources within their boundaries and oversee all the development activities, it restructured the department from 75 'district offices' to 42 'divisional offices', hence, disassociating the departmental structure from district administration. The DOI also continues to conceptualize the construction of large canal irrigation systems, even though projects appear not to survive the pre-feasibility phase. For instance, in 2002, the DOI commissioned a pre-feasibility study for the 'Lower Khageri Irrigation Project' in Chitwan, a completely new surface irrigation project for the area south and west of the command area of the Khageri system (DOI/Multi, 2002). It envisioned to take water from the Rapti river for an area of 2.700 ha and build a main canal of 11 km. Also here, near the Rapti river, lies a heartland of the Tharu, reflected in the ethnic composition of the VDCs in the area (20% Tharu compared to 8% average in Chitwan) and it can be expected that some systems are there (I have seen myself two at least). Adhikari (2001) reports a total of 178 FMIS systems in Chitwan of which about 100 are located in East Chitwan (p.87) and also the pre-feasibility study itself mentions a number of 201 FMIS in Chitwan (DOI/Multi, 2002: II-8). Perhaps then, some of these systems are located in the proposed command area. Saliently, the study makes only a small note of 'some' existing FMIS facilities in the area (supposedly 135 ha), but it largely is silent on water as actually used by farmers at the very grassroots. This professional reflex in irrigation engineering in Nepal is also observed by Gyawali (2009).

7.7 Conclusions

This chapter has documented my attempt to reflect upon the relation between 'our knowledges' and 'ourselves' in irrigation expert thinking to explore how masculinities might be implicated in it. I have tested a method of re-constructing a history of irrigation development in Nepal, creating a self-portrait of 'our knowledges' and re-thinking how 'we' have performed in it 'ourselves' – as engineers, consultants, professionals, experts and researchers of various institutional and disciplinary backgrounds. To re-iterate, the research here has importantly been about performing and negotiating masculinities in irrigation expert thinking itself, a 'show' of expertise – as evidence for peers to see that I know 'our knowledges'. Reflecting on the method, I am inclined to say that the a performance of knowing-our-irrigation-knowledges as a water professional is a *pre-requisite* for making masculinities visible in it. In short, participating in 'normal' professional performances – in this case a study of irrigation development in Nepal – is a necessary step in the process of exploring the masculinity puzzle in irrigation. Or, in other words, if I want to say something about masculinities and 'ourselves' in irrigation, and I expect knowledge and policy elites in development to listen to it, than I cannot circumvent 'our knowledges' and I have to engage with them to create a legitimate professional performance – a position from which I can speak. Here lies a crux for research in irrigation on masculinities, because gender and other social identities are seen in (mainstream) irrigation knowledge and water expert thinking as not belonging to the domain of what needs to be explained (Zwarteveen, 2006). As this chapter shows, one 'ends up' in a cumbersome process of engaging with a body of knowledge and way of expert thinking in which masculinities are presented as non-existent, trying to make them visible. The results of this search process are necessarily tentative and deeply imply the interpretation of the researcher – and my own identity and gender for that matter.

To encourage application of an explorative study of this nature in irrigation elsewhere, I recapture the main elements of the method. First, using the concept of the hydraulic mission in the re-construction of an account of irrigation development in Nepal, helps to scrutinize a persistent enactment of 'projectness' in development thinking as Law and Singleton (2000: 768) call it. Irrigation history in Nepal and elsewhere, is typically presented as a history of projects, and in telling stories about projects, 'we' tend to breathe life into a whole set of assumptions on how the world works and what is considered real. It implies, for instance, in the words of Law and Singleton (2000) that 'we' think that technologies (in part) evolve under centralized control; that they need to be managed; that they involve coordinated puzzle-solving; that they move through stages, in a chronology; that they may have setbacks that need to be overcome; that they evolve as a function of diverse background factors or as a result of other relatively stable conditions in the 'real' world; that there is more technological knowledge around at the end than at the beginning (see p.768-769). As these authors point out, none of this is unreasonable, in many cases this is how technologies develop (in projects), but much of it is assumed or explicitly in 'our' irrigation knowledges and water expert thinking. An effect (or blind spot) of performances of projectness is that we tend to forget (or fail to conceptualize) realities before the project, and also how realities live through projects. Here, the concept hydraulic mission has been useful. It directs inquiry to the high-modernist origins of state irrigation in Nepal (the American TVA model for multipurpose watershed management, the British-Indian engineering tradition for irrigation); it makes explicit that 'our knowledges' in irrigation tend to have a temporal emphasis on the future in which the past and existing 'traditions' are considered an impediment (I had to dig deep to re-construct a history of irrigation of the time before the 1950s, it was envisioned to 'eliminate' existing irrigation systems in the design phase of CIP in 1972, the DOI investigated a completely new irrigation canal project in West Chitwan in 2002); and it reveals that irrigation project development is part of an enduring (hegemonic) conviction of modernisation, creating its own truth that development and history are processes with a determined end goal (the use of the term ‘valley development’ or ‘master plan’ for irrigation development in Nepal in the 1950s, 1970s and again in the 1990s, the objective to rehabilitate ‘all’ FMIS areas in Nepal).

The use of the term hydraulic mission also helps to conceptualize hegemony in irrigation expert thinking, as a dominant experience in irrigation and development knowledge in which the creation of a central state agency for the implementation of irrigation technology appears self-evident. The authority and associated material resources that are ‘embedded’ in this experience, allow DOI engineers as well as other members in the COP of the Irrigation Organisation, to cultivate a very narrow definition of ‘modern irrigation’, linked to dam and reservoir construction, canal design and hectare coverage (cf. Khanal, 2010). In relation to FMIS systems, it enables the DOI (and others) to frame the ‘irrigation question’ as a closed narrative of deferred maintenance, focussing on the need to line canals and rehabilitate infrastructure (cf. Suhardiman and Mollinga, 2012; Singh *et al*., 2014). Other issues such as poor construction quality, choice of technology design, water rights arrangements, conflict resolution practices – to name a few – appear than self-evidently as secondary concerns. Here, it is possible to start seeing how state irrigation projects of engineers (also) have functioned as ‘projects of masculinity’ and perhaps also as ‘projects of hegemonic masculinity’ – an inquiry that I have not been able to make explicit (yet) in this explorative study.

The second element of the method, a feminist reading of history and a re-construction of changing ideas in irrigation and water expert thinking, focussing on the persons who brought them to Nepal and promoted them, is perhaps the most straightforward (and rewarding) part of the analysis – an example of what feminist historical research can do. The analysis has produced a fresh look at irrigation and water use arrangements in Chitwan before the 1950s, also making clear how irrigated agriculture was practiced in the context of the state. The analysis also has retrieved a ‘TVA history’ in Nepal, an account to my knowledge that has not been documented in Nepal to date. In addition, the analysis has revealed a red line in state irrigation projects in Nepal, adopting a birds-eye overview of more than 60 years of interventions in irrigation in Chitwan District, showing many commonalities in project implementation in spite of (acclaimed) conceptual shifts in professional practice in irrigation. The research has contextualized some key irrigation policy documents in Nepal, also producing a list of state planners, engineers and other professionals, who were involved in it in Chitwan and who happen to have predominantly the male gender – from Bhim Bahadur Pandey in 1946 to Bharat Manji Dhital in 2010 (then Chief Engineer of Chitwan). In contrast to the histories of Chitwan as ‘we know them’, a self-portrait of irrigation knowledge as I have constructed it, makes the role of men in them visible at glance. It is an account of irrigation expert thinking that enables further research in irrigation on masculinities.

The third element of the method has been the extensive use of photos and maps in the analysis to document some of the shared experiences and positive self-identities that ‘we’ have constructed (and negotiated) in development and in ‘our’ expert thinking. Quite literally, I have looked to the images as ‘self-portraits’, recognizing the potential to engage in self-discovery. In adding ‘small interpretations’ under the photos as subtexts, I have made a first attempt to learn about changing performances of masculinity in irrigation. Much more analysis and careful interpretation is required here, particularly in relation to maps and how they bring into existence a (hegemonic) performance of projectness which reflects and structures ‘our thinking’ – a topic that I have not been able to investigate in this thesis. In creating a pictorial documentary of shared experiences and positive self-identities, aspects of changing (and negotiated) performances of masculinity can be seen. In short, in the 1950s, irrigation engineers along with other state agents emerged as the new intermediaries between the state and the people, ‘replacing’ it seems, performances of jimindars in the Terai as the traditional creators of new land and water flows. In the 1960s, 70s and 80s, irrigation engineers appear to have performed as authoritative and respected holders of technical knowledge. They were not portrayed on elephants or with game they shot, but they were photographed with their irrigation technology, as educated planners and construction bosses in the Terai. ‘Their’ systems appear to have been viewed as new symbols of modernisation and statecraft, perhaps as the ‘new elephants’ of the government. In the 1990s and 2000s, performances of engineers resemble that of chiefs whose role is to listen to the concerns of ‘their’ constituents and make decisions, displaying ‘himself’ as a man with big networking capacities. To re-iterate, this is a first and preliminary interpretation and other and contrasting performances of masculinity can also be identified (for instance between American ‘hands-on’ engineers and Nepalese ‘white-collar’ engineers in the 1950s). It shows, however, that performances of positive self-identities and the associated masculinities (and the self-questioning of professional identity that comes with it) have helped engineers to restore and preserve a position of authority (and hegemony) in irrigation expert thinking.

Chapter 8:

General discussion and conclusions

8.1 Introduction

This thesis has documented my attempt to study masculinities among irrigation engineers and water professionals in Nepal. I started my research journey with a hypothesis that there is something masculine about the irrigation and water management profession, both in the West and in Nepal. I formulated this hypothesis based on personal experience, travelling from the Netherlands to India and Nepal for study on irrigation, sharing – and sometimes not sharing – acts of professional practice and performances of masculinity across intercultural borders. I also found ground for this hypothesis in feminist theory and academic questioning of masculinity in irrigation (Zwarteveen, 2008; 2010; 2011). In my study, I started with one personal commitment: to understand masculinity as an intercultural phenomenon in the broadest sense of the word – not as something that is typical for men in Nepal or particularly distinct for irrigation engineering and technical professionalism in South Asia. My commitment partially grew out of an unease that I developed in reading development and social science and anthropological literature on water, irrigation, development and gender. Mainstream development literature tends to discuss issues of development and gender in a de-politicized and professionalized way, usually from an instrumental or policy perspective, while the more critical social science and anthropological studies emphasize descriptions of development and gender as issues of specific localities, giving a nod to some idea that they are part of a larger (hegemonic) structure in society. The combined effect is that the marginalization of women (and men) in the South and the existence of many other gender disparities tends to be seen as an indigenous or local issue, primarily related to a supposedly distinct patriarchal culture in a 'backward' country like Nepal. The problem is that these views do not directly implicate the culture and gender of expats and development professionals themselves (the studies of Lynch, 1993; Laurie, 2005; Zwarteveen, 2008; 2010; 2011 are notable exceptions in the field of irrigation and water management). It is useful to address this limited attention in literature and in our expert thinking because in practice, it is precisely the global dimensions – the Western ideals and behavioural norms in development practice – that represent hegemony in Nepal. The masculinity and expert-status of foreign engineers and water professionals, notably from the West, embody a gender hierarchy in which both Western and Nepalese professionals have to position themselves.

My understanding of gender and masculinities has critically framed the study. If I would have opted for essentialist, positivist or normative definitions of masculinity – a view that is propagated in science in many fields – then this thesis would have provided for easy reading and be half the size. Yet, using a standard or fixed definition of 'men' and 'masculinity' – who men really are and what masculine behaviour really is – would not have enabled academic inquiry into changing gender practices. Invariably, the focus is then exclusively on the male body or what we think constitutes 'the male', taking testosterone levels, beard growth and the size of jaws as a reference of true maleness. This study would then have linked the professional culture in irrigation to the performances of men because irrigation is said to constitute a tough and hard world and men supposedly are physically stronger, and more rational and competitive than women – end of story. Appealing as such an explanation may be from a popular (science) perspective, it fails to clarify, for instance, why there exist such diverse experiences of masculinity (and femininity) or why accounts of masculinity are so contested (Gilmore, 1990; Whitehead and Barrett, 2001). Nor does such an approach allow to conceptualize manhood beyond the boundaries of the physical (male) body, failing to explain how masculinities inform the politics of institutions and the global system, and how masculinities are implicated, for instance, in the way we see, think and talk about irrigation and water management. For such an analysis into masculinities, it is required, first, to conceptualize masculinities and femininities as shifting and contextual – arising (and disappearing) in the intersections of class, caste and ethnicity and other axes of differentiation such as nationality and professional discipline – and second, as Connell (2005 [1995]) argues, to acknowledge that masculinities simultaneously constitute *a place* in gender relations, *the practices* through which men and women engage that place in the structure of gender relations and *the effects* of these practices in bodily experience, personality and culture.

In using this critical interpretative definition of masculinity, the political project of this thesis is to *make* masculinity a topic of controversy and debate. The objective is to make men (as irrigation engineers and water professionals) and masculinities ('their' practices and the effect of 'their' practices) visible in irrigation and water management, and to show that 'masculinities matter!' in development (the title of an edited volume of Cleaver, 2002 on men, gender and development). My conceptualization of masculinities is framed by the feminist ambition to make talk on masculinities (and power) an explicit part of debates in development. Yet, this precisely is what is so hard to achieve. When masculinities are defined as shifting and contextual, as I do, as a site of contestation and negotiation, it follows that there always are multiple and co-existing explanations 'available' to clarify (gendered) behaviour and practices. In today's world, however, (positivist) technoscience is hegemonic, it constitutes much of 'our' experience of the world and that of irrigation engineers and water professionals. It presents the world as universal, knowledgeable and measurable with the effect that other ways of knowing are marginalized and discarded – the co-existence of multiple realities denied (Zwarteveen, 2006). Saying in this context that there exists such a thing as 'professional cultures' and 'professional identities' in irrigation, and qualifying behaviour or practices of irrigation professionals as non-rational and as (partially) masculine or as an effect of masculinity is then difficult and likely to be disputed. In this background, being trained myself as an irrigation professional and sharing a faith in technoscience, the challenge has been (also for me) to identify and visualize masculinities in irrigation, not just as the behaviour of engineers and water professionals, but also, for instance, as the effects of masculinities implicated in irrigation expert knowledge and in the construction of irrigation projects. In its core, this thesis has set out to explore windows to *identify* associations between men, masculinity and power in irrigation – as behaviour of professionals within the family and while doing the job, in engineering education and in the field, in the use of irrigation data in policy and in professional experience in irrigation development.

The conceptual backbone of this thesis has been the concept of cultural performance, a concept, metaphor and set of ideas on the 'cultural infrastructures' of professional performance, as Oldenziel (1999) calls it. The concept proved its worth in the process of writing the thesis, providing an overarching framework to establish linkages between the gender of engineers, the practices of water professionals and the attributes of irrigation knowledge in a multiplicity of ways – some of which have been explored and highlighted in this thesis. The strength of the concept really is the ritual or processual approach to understand 'culture' in the broadest sense of the word, from gender performances of engineers to professional cultures in irrigation and technical interventions in the field. It conceptualizes masculinities – and the effects of masculinities – as something that is alive and present, as a phenomenon that is in-composition, open-ended, and continuously contested and negotiated. I also have used performance as a processual view on agency; how subjects *develop* and *enact* agency *in transition* – in the process of becoming someone else – enacting new identities and actions, from passions and pleasures to self-justifications and other knowledge claims, also re-generating masculinities in the process. In these terms, it also steers inquiry on masculinities away from the physical male body to one of changing gender practices.

For the final discussion and conclusions, first, I reflect on what has been defined as the second domain of masculinity in the irrigation world – the professional domain. Then, I reflect on the third domain of masculinity in the irrigation world – irrigation knowledge and water expert thinking; and lastly I share self-reflections and discuss ways ahead for further research on masculinities among irrigation engineers and water professionals.

8.2 Masculinities among irrigation engineers and water professionals

As a way to think about masculinities in irrigation, I have used the work of Zwarteveen (2011) who identifies the irrigation world as a masculine world along the lines of three dimensions: (1) men's control over rights to irrigation water and infrastructure; (2) male domination in the professional irrigation domain, and (3) gendered thinking in irrigation knowledge. This framework has been a useful starting point for this thesis – for two reasons. First, it makes insightful that most academic work in irrigation on gender to date has focussed on the first dimension of masculinity and that an inquiry in the second and third domain has not occurred before now. Work in Nepal in irrigation on gender is no exception. It has predominantly focussed on analysing the uses and rights to irrigated land and water with the objective to show that women, alongside men, also are important farmers and irrigators. The goal of this work has been an advocacy for women empowerment and gender equity, a campaign that has resulted in Nepal, and elsewhere in South Asia, in state policies that seek to guarantee the formal representation of women in irrigation projects and WUAs. Second, by defining the irrigation world as masculine, the framework also makes clear from the onset that the 'lack' of an inquiry in the second and third domain of masculinity in irrigation is no coincidence or an apparent case of 'lack of knowledge'. In using the term masculinity – not gender – hard questions instantly follow why it is that the associations between masculinities and professional performance in irrigation are taken for granted and appear as self-evident, unchangeable and indeed, as gender-neutral. It inherently follows then that the lack of an inquiry into these domains constitutes 'a strange silence' as Zwarteveen (2008) calls it, which is nurtured or left unaddressed by those men who control water powers and knowledge in irrigation, giving a thesis a clear direction as a political project: to provide an informed plea for more explicitly identifying, naming and unravelling the linkages between men, masculinities and power in irrigation with the goal to create debate.

Three chapters in this thesis – Chapter 3, 4 and 5 – present an inquiry into the second domain of masculinity in irrigation: the professional irrigation domain. The chapters investigate, from different angles, how masculinities among irrigation engineers and water professionals are sustained through the inclusion and disciplining of young professionals in the profession. I selected this topic because it appeared to me as particularly apt and relevant for this study. Juniors need to learn or be taught about professional identities and cultural practices in order to sustain associations between masculinities and professional performances in irrigation. This implies that 'masculinities' likely are to be most fully expressed – and visible for research – at the time that juniors enter the profession. Hence, juniors need to be given an opportunity to learn about masculinities and seniors want to make sure that juniors adopt the 'right' masculine behaviour and practices. At the same time, it can be expected that the professional culture in irrigation gradually changes with the entry of apprentices in the profession, bringing in new ideas and values, transforming or perhaps even challenging masculinities along the way. In fact, the perception is, both in the West and in Nepal, that the masculinity of professional fields like irrigation automatically changes over time with the entry of new male and female professionals, introducing gender progressive change as a trickledown effect of education, progress and modernization. These assumptions have guided the inquiry.

To approach masculinities in the professional irrigation world as an intercultural phenomenon and live up to my commitment, I conceptualized the 'irrigation world' as irrigation governance and the professional fields of irrigation engineers and water professionals as communities of practice (COP). In this way of thinking, irrigation governance is the product of interplay between various professional COPs. This conceptualization makes inquiry in irrigation on masculinities (more) relevant and interesting – in three ways. First, it acknowledges that masculinities among irrigation, particularly in relation to engineering, extend far beyond the boundaries of irrigation departments into colleges, consultancy firms, NGOs, lending agencies, professional associations and research institutions. It avoids identifying irrigation departments as the usual culprits of male hegemony in irrigation, answering to my determination to see masculinity in irrigation as intercultural. Second, the terms governance and professional COPs inherently acknowledge the diversity of institutions and actors involved in irrigation, giving direction to research and steering an inquiry into identifying specific (sub)-COPs in the overarching COP of water professionalism in order to make talk about masculinities specific and relevant. Third, the concept of COP provides a conceptual bridge between the professional sphere and the family-society sphere, allowing for interpretations in multiple ways: (1) 'doing the job', the COP of professionalism; (2) 'being a member in a family and society', the COP of the National Elite; and (3) 'doing gender', masculinities and femininities as COP (Paechter, 2003a). In short, the use of the same term – 'COP' – for various peer groups and social learning environments, aptly captures a reality that we all know too well: engineers and professionals also are sons, husbands and fathers (or daughters, wives and mothers), performing gender and having a class and caste identity.

The resultant approach captures much of the fluidity and liveliness of gender and professional practice in irrigation that people describe in practice, both in the West and in Nepal. It re-shapes an inquiry in irrigation professionalism on masculinities into one of roadways – not one of position, stable identity or locus of agency. The question is how juniors *become* seniors, how boys *become* men and how students *become* professionals, and how they shape, perform and negotiate masculinities in the process. As argued, the goal is not to construe masculinity as a stable practice or particular behaviour that is tied to a discipline, job or organisation, but to understand how associations between masculinities and professional performances tenuously are constructed *through time*. For reasons of time and space, I focussed the analysis on the COP of the Irrigation Organization, which I define as an (international) alliance or specific sub-COP of irrigation professionals (or policy elites) in the overarching COP of water professionalism, and within this COP, I have focussed on the professional performance of the Irrigation Engineer. Admittedly, as I also have noted in the introductory chapter of this book, my choice to focus on the roadway for becoming an Irrigation Engineer in Nepal has been inspired by the received wisdom and claim that the bureaucratic tradition in irrigation – the masculinity of irrigation departments – represents the most dominant form of male hegemony in the water sector. I am aware that the almost exclusive focus on the Irrigation Engineer rests (very) uneasily with the premise of my thesis to unravel masculinities as an intercultural phenomenon. I only can re-iterate that I refrained from using the conventional approach for identifying the masculinity of the Irrigation Engineer – focussing on 'his' position and stable identity – and say that I have used my own theoretical principles: (1) seeing masculinities as an intercultural phenomenon; (2) identifying the DOI and the Irrigation Engineer as one of many players in the COP of the Irrigation Organisation, and (3) making connections, where possible, with performances of Western professionals to unveil hegemony and norms of Elite Manhood in Nepal.

The next three sub-sections reflect on the main conclusions of Chapter 3, 4 and 5.

8.2.1 Masculinities in education, professional associations and the DOI

Chapter 3 analyses the formal institutions that constitute the roadway for becoming an Irrigation Engineer in Nepal: (1) engineering and water education; (2) regulatory bodies and professional associations, and (3) the Department of Irrigation (DOI). These institutions present (just) a *selection* of institutions that exist on roadways for becoming an irrigation engineer (or water professional). To iterate, I have focussed on one employer-organisation, the DOI, and two professional disciplines, civil and agricultural engineering. This particular focus is valid for a study on the Irrigation Engineer – written with capital letters – but not when taking into consideration other (irrigation) engineers and water professionals in the COP of the Irrigation Organisation. The DOI and other engineering departments in the government of Nepal, have never 'consumed' all engineering graduates in the country, meaning that the majority of engineering students traditionally have looked somewhere else for employment. This particularly is true today, because the status of government service has declined, corresponding with a trend that the private sector in Nepal, including the many head-offices of NGOs and INGOs in Kathmandu, provide for better pay and more promising career prospects. Many irrigation engineers and water professionals in the COP of the Irrigation Organisation in Nepal are employed as (engineering) consultants, building contractors, technical staff at (I)NGOs and lending agencies or as researchers and teachers at engineering colleges and universities of technology. In contrast to the DOI, these employer organisations tend to draw (bachelor) graduates from a wide range of disciplines, from civil, agricultural, mechanical, electrical and computer engineering, and also from architecture and (hydro)geology. This implies that the institutions and the roadway that I have studied are only partially representative for irrigation engineers and water professionals in Nepal.

This having been said, I maintain that there are good reasons to focus on these organisations. Education at engineering colleges and employment in the civil service represent the most closed institutions in Nepal, making the performance of the Irrigation Engineer one of the most ‘regulated’ gender performances in Nepal. On paper, these institutions are public and open for any person eligible to apply, but in practice they mainly benefit a select group of men who have the education and resources to fulfil the criteria for application. These organisations function thus as closed institutions of the high-class, upper-caste male elite in Nepal, fulfilling a dual role as key sites for learning about engineering and water professionalism and as principal breeding grounds for the cultivation of performances of Elite Manhood in Nepal. The dual role of these institutions has deep roots. There is no official history of discrimination against women at these institutions, but women and other men in Nepal, like in the West, have been absent in the development of these organisations. In a feminist analysis, therefore, the growth of engineering education, the set-up of regulatory bodies and professional associations, and the struggles of engineers in the DOI to acquire an independent agency for irrigation and water resources development, read as an effort of male members in the COP of the National Elite to carve out a domain for performances of Elite Manhood. This view is perhaps controversial but it does justice to realities of exclusion. It makes visible, for instance, that it is merit-based selection for education and employment that also (or partially) produces unfairness across professional and personal boundaries – not quotas, scholarships and other affirmative action policies for women and disadvantaged groups. A feminist interpretation also instantly makes clear that becoming an Irrigation Engineer, because it (partially) is about performances of Elite Manhood, also has critical meaning in the family-society sphere – not just in the professional sphere. An analysis of occasions like the Engineers’ Day of the NEA and the activities of NEWS, have shown that it is almost impossible to limit a study of masculinities to the boundaries of professionalism. These reflections have important implications for studying masculinities ‘among’ irrigation engineers and water professionals.

The analysis in Chapter 3 reveals that a feminist reading of history pays off to expose masculinities in public and professional institutions. Perhaps this is particularly true for Nepal and other countries where (institutional) histories of education, professional discipline and public departments have been sparsely documented – it makes research worth the effort. The absence of basic overview histories on (public) institutions, however, also makes research on masculinities a challenge. For the analysis in Chapter 3, I went through a three-step approach of (1) gathering the basic information to produce an institutional history, (2) analysing and double-reading the institutional history to arrive at a critical interpretation on the politics of the institution, and (3) applying a feminist reading of the institution (and its politics) to see where masculinities come in. In this regard, it is worth re-iterating that the academic value of Chapter 3 importantly lies in the presentation of new empirical material. Particularly worth mentioning are the gender and caste segregated enrolment data of students at engineering colleges for diploma, bachelor and master level education and the data collected on regulatory bodies and professional associations in Nepal. The added value of the histories of engineering education and the DOI mostly lie in the way how available, often dispersed information has been ordered and presented into new, critical (feminist) readings of these institutions.

8.2.2 Masculinities in self-normalization and transitional performance

The analysis in Chapter 4 follows-up on the main conclusion of Chapter 3, the dual role of the formal institutions on the roadway for becoming an Irrigation Engineer, (1) as sites for learning about performances of engineering and (2) as breeding grounds for learning about performances of Elite Manhood. This conclusion leads to the hypothesis that membership in the COP of the Irrigation Organisation is not only sanctioned through formal regulations – education qualifications, exams, quotas, membership criteria, promotion rules and other policies; but also through the informal milieu at these institutions – the social stereotypes and cultural norms of the culture in society. Put simply, for becoming an Irrigation Engineer and performing up to the professional norm, it is not enough to fulfil norms of technical performance, i.e. get an engineering degree, register for an engineering association and secure employment in the DOI. An Irrigation Engineer also needs to fulfil a norm of cultural performance, both within the family-society sphere and in the professional sphere. Within the family-society sphere, he (or she) is expected to perform as a man (or woman) of standing in the COP of the National Elite, and in the professional sphere, juniors need to participate in the informal milieu and learn about the appropriate skills, attitudes and passions to perform as a 'gender authentic' Irrigation Engineer (Faulkner, 2009a; 2009b). Here, we really get to see how the performance of the Irrigation Engineer intersects with the practice of Elite Manhood. The private sphere of the family and the public sphere of the profession are construed by the social stereotypes and cultural norms of (elite) society in Nepal, meaning that the performance of the Irrigation Engineer simultaneously is a cultural performance within the family sphere and the professional sphere. To understand masculinities in irrigation, it is thus critical to work around the dichotomies of personal/professional and private/public, because notions of masculinity and femininity itself construe these categories – assigning the public as masculine and the private as feminine (Tamang, 2002). This point is central to feminist scholarship but one that has perhaps received insufficient attention in the body of literature on water professionalism. In theory, therefore, it may be useful to start talking differently about identifying masculinities 'among' irrigation engineers and water professionals.

When thinking about practical research, however, this is easier said than done. Capturing the intersectionality of Elite Manhood, as exemplified by the performance of the Irrigation Engineer, easily becomes an exercise of analysing everything because the list of intersections is potentially endless (McCall, 2005; Ludvig, 2006; Phoenix and Pattynama, 2006). As a reminder, an important question of this thesis is *how* to identify masculinities in irrigation, a question of method – not content. I found a workable method in the adoption of a somewhat unconventional questionnaire approach, making use of the performativity of a survey.

Answers are then not treated at face value, but appreciated for their liveliness, as if they reveal a process of culture in the making, not only documenting what respondents think but also what they should or desire to think. An analysis of the answers is then able to reveal some of the processes of self-normalization, seeing the filling-in of the questionnaire itself as an act of agency and as the development (or cultivation) of desire. A difficult point in this approach, as I have noted, is the construction of the questionnaire, which is invariably based on gender biases, social stereotypes and professional values of the maker – those of myself in this case. Stereotypes and biases, and I would say subjectivity in general, cannot be avoided, but a (more) careful (and reflexive) preparation of a survey really is a pre-requisite in this approach. Another issue that perhaps has received insufficient attention is the question of 'representation' – key to any questionnaire approach. In adopting a feminist understanding of 'representation', I deliberately have targeted female engineers in the DOI to assure their participation and also senior staff in the agency, seeing them as role models of professional practices and masculinities in the organisation. However, such a targeting of respondents has come at the 'cost' of the views of the majority of junior and middle-aged (male) overseers and engineers in the DOI, something that I was aware of and ideally would have liked to resolve, but also something that I considered acceptable given the topic at hand. Furthermore, a study on Elite Manhood requires questions on the home and family situation, and on interactions between male and female staff at work. Not everybody is confident to answer these type of questions, at least not by means of an anonymously-used questionnaire.

In spite of these difficulties (or limitations), a questionnaire is a relatively straightforward approach to (1) obtain background information of respondents on their situation within the family-society and professional spheres; (2) assess opinions on social stereotypes and cultural norms; and (3) document perceptions on engineering and other professional practices. With a performative interpretation of the responses of the questionnaire, it is then possible to show that personal preferences and stated irrigation tasks and priorities only are partially natural and rational, and also are a deeply constructed desire along the axes of class, caste and gender. To re-iterate, arguing that professional priorities like 'system construction' and 'water use efficiency' are ultimately expressions of the passion of the Irrigation Engineer – expressions that 'stick' more easily to male engineers than to female engineers – does not mean that these irrigation goals have no technical rationality in itself or have no value in their own right.

The questionnaire approach can be useful for analysing some aspects of agency that apprentices (are expected to) develop in daily interaction with their masters – how subjects become active players in creating new social environments through acts of self-disciplining and self-normalization. As I have noted, the Foucault-view on the 'voluntary' reproduction of everyday habits of masculinity and femininity into unequal gender relations is popular in social science. It offers a powerful explanation for the existence and resilience of hegemonic structures in society like patriarchy, hegemonic masculinity and norms of Elite Manhood in Nepal. More specifically, for the irrigation profession, it explains why conformity and conservation pay in the words of Chambers (1988), and why it is safest for apprentices to be seen as professionally sound, as persons who respect convention and confine research and action to recognized problems using known methods. Indeed, this view goes a long way in explaining how boys become men and how men become engineers, re-creating desire and masculinities along the way, but two things should be kept in mind. First, in the Western, secular-liberal outlook, the concept of agency is often reduced to the intentional capacity to resist norms based on an assumption of the universality of desire. This is a problem, because the Foucault-perspective then fails to explain why men *and* women engineers, very consciously, engage in acts that aim toward continuity, stasis and stability. The remedy is to contextualize desire and use that as a starting point for analysis. Second, self-normalization fails to capture the view that becoming an engineer (also) occurs through undergoing transitional experiences, disconnected from daily practice. Saliently, this view had received much less attention in social science, while the idea it not new. In this background, my attempt to theorize on transitional performance, going back to the work of Victor Turner on liminality and the ritual process, are ideas that await further research. A risk in adopting a purely anthropological view on transitional performance is the tendency to treat experiences and careers of engineers in a somewhat de-contextualized and a-historical manner – a pitfall that I have not been able to fully avoid in my analysis of transitional experiences.

8.2.3 Negotiating masculinities: Women engineers and "other men" in irrigation

Building on Chapter 3 and 4, Chapter 5 takes as starting point the masculinity of the formal institutions and the informal milieu that characterize the roadway for becoming an Irrigation Engineer. The conclusion that the roadway for becoming an Irrigation Engineer is gendered leads to the insight that women and 'other men' do not share the same entitlement to become an Irrigation Engineer. Again, it is useful to make a distinction between technical and cultural performance. Generally, Nepalese women are successful in fulfilling the norm of technical performance – they get engineering degrees, register for engineering associations and some of them secure employment in the DOI – but it is a different story to fulfil a norm of cultural performance and being able and developing a desire to act like an Irrigation Engineer. As noted in Chapter 4, both women and men (and 'other men') face subjectivation in the DOI. Yet it appears that women in particular face a double subjectivation. Her participation in the informal milieu of the DOI makes a woman self-conscious about her role and position as engineer, allowing her to execute job responsibilities, but simultaneously, the masculine norms and behavioural culture in the informal milieu secure her subordination in the organisation as a woman. In one or the other way, women in particular – and in theory also 'other' men – are thus faced with the prospect of having to negotiate masculinities (and femininities). I focussed the analysis on performances of women engineers in the DOI because the heightened visibility of women in the DOI as a result of their low number, make 'their' negotiations on masculinities and femininities (more) easily detectable in comparison with those of 'other' men. The lack of an analysis on the differences among men in the DOI and among men in the COP of the Irrigation Organisation is a limitation in this study. I only have touched upon some of the differences between Nepalese and Western men, but not really, for instance, on the differences between upper-caste B/C men and upper-caste Madhesi men, or between upper-caste B/C men and Janajati men. To re-iterate, also between these people, not just between men and women, processes of subjectivation and negotiations on masculinities (and femininities) take place.

In the case of women engineers in the DOI, I broadly found negotiations on masculinities to happen along the lines of three narratives: (1) women refrain from a (cultural) performance of an Irrigation Engineer and instead perform as 'lady engineers', securing the status of a 'good woman'; (2) women pursue a (cultural) performance of an Irrigation Engineer and try to achieve professional recognition, risking their status of a 'good woman'; and (3) the entry of women in the engineering profession marks a decline of the (cultural) status of the Irrigation Engineer, which is increasingly considered a job suitable for all sorts of people. An apparent commonality in these narratives is that women in engineering appear to have very limited (political) agency to really challenge masculinities. They seem unable or not willing to perform as 'gender benders' in irrigation. This implies that we need to think differently about social inclusion and gender progressive change, because the liberal idea that individual women, once educated, can and are willing to challenge 'backward' and 'patriarchal' structures underpins contemporary development thinking.

The analysis in this chapter differs from most other studies on the position of women professionals in irrigation in the sense that women are not seen as victims, but as active (political) agents in the creation of their subordination. As I have noted, this lesson is hard to digest for engineers, development practitioners and other professionals who share secular-liberal and progressive assumptions about development, but it is not new (Zwarteveen, 2006). Subjectivation – not to be confused with subordination – is a central concern in feminist theory and it is time to give it serious thought in thinking about development practice, also in academia and university management. One starting point is to recognize that both men and women engineers are aware of the normative culture in the DOI and reflect on male-domination, but do not associate the prevailing 'engineering culture' of the organisation with masculinities and the performance of norms of Elite Manhood. Engineers have internalized a strong conviction that science and engineering is rational and universal, passionately propagating that view that engineering itself is disconnected from meanings of masculinity and femininity. In this regard, the occasional gender-awareness-campaign to create 'consciousness' among women (and men) do more damage than good. They trivialize the subordination of women as a matter of being naive and ignorant. This idea is wrong. The cultural taboo of field work, for instance, is actively and sometimes consciously maintained by female engineers – not only by male engineers. The complexity of the development of agency and desire among engineers, along the lines of gender, make the DOI a very different working place for women than for men. As I have shown, for women, the roadway for becoming an Irrigation Engineer translates into an accumulation of disadvantages, making it much more difficult for them to perform up to the standard, culturally and in effect, also technically. Women engineers in the DOI typically face a career plateau after about five years of service, feeling that they are not doing the real engineering stuff. It is thus correct to say that women face subordination in the DOI but wrong to assume that women have no active and partially conscious role in this. Here lies an informed plea for the creation of critical mass – for the introduction of quotas. The challenge is not to create 'gender awareness' but to change norms and get more women professionals into the DOI.

8.3 Masculinities in irrigation knowledge and water expert thinking

Two chapters in this thesis – Chapter 6 and 7 – present an inquiry into the third domain of masculinity in irrigation: the domain of irrigation and water expert knowledge. For some time now, an argument has been advanced that irrigation knowledge itself is gendered and has strong masculine connotations (Zwarteveen, 2006; 2010; 2011). To re-iterate, also for other knowledge fields than irrigation, this argument has been propagated by feminist philosophers (Harding, 1986; Haraway, 1991; Butler, 1999 [1990]). By all means, this is not an easy argument, particularly not for those who believe in the impartiality and rationality of (positivist) technoscience. Also for an applied-science discipline like irrigation engineering and water knowledge, a study on this argument is difficult to digest. Zwarteveen (2006) is one of the few who has made an attempt to bring these two views together – 'to see women and think gender in irrigation'. Her work illustrates how difficult it is to articulate feminist concerns and shows that knowledges are partial and situated, while trying to remain faithful to the existing epistemologies of normal water professionalism and the related claims of rationality and universalism. The apparent risk in arguing that irrigation knowledge and water expert thinking is not impartial and gender neutral – and can be identified with 'masculinities' – is losing the possibility to communicate with irrigation engineers and water professionals on their knowledge. This risk also is my concern, because the goal is to come to terms with the masculine subject in development and make masculinities a topic of debate in irrigation.

As said, the first challenge in this study is to deal with the absence of a critical interpretative tradition of knowledge seeking in irrigation. It can be said that this is exactly what gives normal irrigation an association with masculinity. It 'makes' it masculine in the sense that irrigation knowledge and water expert thinking inherently pre-supposes and is built on a hierarchical dichotomy between women and men, in which 'men' symbolically and metaphorically represent everything that is defined as irrigation and professional, and 'women' that what is defined as 'non-irrigation' and 'non-professional'. This thinking provides a barrier for seeing irrigators, engineers and other water professionals as gendered beings in water knowledge. At the professional level, this is particularly true for seeing women-as-engineers and women-as-professionals, *but essentially also for seeing men-as-engineers and men-as-professionals*. In normal irrigation thinking people feature as 'engineers', 'experts' or 'professionals' – not as women or as men. At a deeper level, this thinking also provides a barrier for recognizing meanings of masculinity and femininity in irrigation knowledge and the related cultural process of attributing higher values to what is labelled 'masculine' compared to what is labelled 'feminine'.

For a study on masculinities in irrigation knowledge and water expert thinking, there is thus no other 'way out' than to adopt a critical interpretative perspective. To re-iterate, normal irrigation knowledge provides very little space for women *and men* to exist, because it sees gender and other social identities as not belonging to the field of expertise in irrigation (Zwarteveen, 2006). Making men and masculinities visible in irrigation, by using the existing conceptual language of normal irrigation professionalism, is the same as making women and femininities visible in irrigation – it is doomed to fail. That having been said, the critique and deconstruction of normal irrigation knowledge can be made easier to digest for irrigation engineers and water professionals through a strategic selection of critical interpretative theory. It is here that I see great value in the cultural performance perspective. As explained, this perspective allows making a distinction between technical and cultural performance, two dimensions of professional performance that always coincide. This means – or what I hope it makes possible – that the masculinities associated with knowledge can be studied without immediately discrediting the usefulness of irrigation knowledge for technical purposes. In short, the selection of the concept cultural performance for research in irrigation embodies a strategy to negotiate masculinities in irrigation knowledge and water expert thinking.

A cultural performance perspective on the use and presentation of scientific data and technical representations, like data in policy on irrigation, or for instance, the construction of maps and display of photos is not new. When seeing 'irrigation knowledge on stage', as part of public drama, it means that irrigation expert thinking is not just a matter of innate skills and knowledge, aiming to make sense of the world, but also a product of habitual, ritual and stylized actions, and occasionally perhaps, the outcome of conscious management of professionals who aim to create credible voices for themselves. Put simply, in assisting the social and political projects they support, the use and presentation of scientific knowledge is a social process through which the credibility of expert advice and also, as I have argued, the gender identities of experts are re-produced, challenged and sustained. As I have demonstrated in this thesis, performance theory produces a fresh look at the social dimensions of scientific and technical knowledge production, trying to understand, for instance, how the presentation of data in policy on irrigation helps to sustain professional authority and promote a new cultural hierarchy. It puts the 'active' role of experts in the centre of analysis – as cultural agents who partially consciously and in a liminal state, normalize, defend, secure, or expand their professional credibility and social status. It is then a small step to conceptualize experts as cultural agents *with a gender* and hypothesize that gender is implicated in the production of professional credibility. To my knowledge, adding an (explicit) gender outlook to a cultural performance analysis on knowledge production – to understand how technical representations enact professional credibility and meanings of masculinities and femininities in the process – is new and has not been conducted yet. In this regard, the academic value of the chapters lies mainly in the theoretical approach – an interpretation (and negotiation) of 'known' information on irrigation from the perspective of cultural performance.

While it is a small step to conceptualize the implications of gender in irrigation knowledge and water expert thinking, it is more difficult to empirically ground this argument. I focussed part of my analysis on irrigation data in the recognition that engineers and professionals associate numbers with 'facts'. The production and presentation of numbers in irrigation, like in other professional fields, can be considered to embody a common practice in sense making and also a claim of truth of engineers and water experts, displaying the logic, rationality and universal application of science and technology in one of the most visible and convincing forms possible. In order to 'counter' the hegemonic associations in a show of numbers-as-facts in (water) technoscience and see how masculinities (may) 'stick' to data in irrigation, it is necessary to adopt a broad understanding of masculinities. To repeat: masculinities simultaneously constitute *a place* in gender relations, *the practices* through which people engage that place in gender and *the effects* of these practices on experience and culture (see discussion above). To start with the last, the (cultural) effect of data in policy on irrigation and other technical representations in irrigation is hegemony, a claim or cultural experience of truth that ascends through culture, institutions and persuasion. Then, looking to practices, it is predominantly male engineers and male water experts – and only a few female engineers and female water experts – who are (and have been) engaged in the production of irrigation data and technical representations, making sense of the world and creating credible voices for themselves. And lastly, considering place, 'their' credibility translates into an influential performance of professional identity in gender relations, one of power, control and high cultural status – the performance of the Irrigation Engineer or more generally, the professional expert. With this definition of masculinities in mind, it is possible to empirically ground performances of gender and norms of masculinity and femininity 'in' irrigation knowledge, and to see how professional practices, like the use of irrigation data, translate into a ritual empowerment of expert voices in irrigation knowledge – the performance of P/ASTHA.

For clarification, I am not saying that female engineers and female water professionals would construct and use data on irrigation differently. I am suggesting that the use and presentation of data on irrigation is more likely to grant authority to male engineers than to female engineers, and also that data on irrigation are more strongly associated with what men do than with what women do. The result is that irrigation expert thinking and water knowledge tends to 'stick' more easily to male professionals than to women professionals.

The next two sub-sections draw out the main conclusions of Chapter 6 and 7.

8.3.1 Expressions of "masculinity": The performativity of irrigation data in policy

The topic in Chapter 6 is the production and use of irrigation data (or irrigation statistics) in Nepal. Whatever is captured in numbers in normal irrigation thinking (e.g. meters canal constructed, hectares irrigated, water flow delivered) tends to obtain meaning as 'a fact' and is then considered to exist, particularly when it concerns a 'counting exercise' for the collection of irrigation data. To re-iterate, this makes sense when looking from a science or technical performance perspective. It allows for measurements and calculations and makes talk on policy and project planning concrete and practical. Looking from a cultural performance perspective, however, it can be seen that irrigation data also do something else: they shape and give meaning to the ideas and perceptions of irrigation engineers and water professionals, conveying 'their' attempts to make sense of the world, ascertaining 'their' credibility and expressing 'their' authority in professional and social hierarchies. In this view – seeing knowledge practices as performative – it is possible to see data on irrigation as a cultural expression of professional performance and of masculinities among irrigation engineers and water professionals. The use of data on irrigation can be conceived as a habitual and customary professional process, as a knowledge practice that simultaneously describes and reproduces 'reality', following professional conventions and technical norms, and re-generating the ideas and identities of experts who participate in irrigation professionalism. It is then a small step to empirically ground the argument that the use of data on irrigation sustains and supports the views (and identities) of a majority of (male) irrigation professionals and the wider networks of power and hegemony in which they operate.

As a ritual process, the use and production of data on irrigation have the capacity to reflect and structure the experience of irrigation professionals. They are the product of a stylized repetition of acts, simultaneously disciplining and producing irrigation professionals. Two processes can thus be said to occur at the same time. First, data on irrigation, when defined as carefully constructed presentations of the present, reflect (or describe) the views, aspirations and desire of irrigation professionals, describing 'their' experience (what they think to exist). Second, data on irrigation structure (or enact) the experience of irrigation professionals, producing the eyes of professionals through which they become to view the world and generating the desire to act (intentionally). The combined effect of these two processes is the production of credibility for particular worldviews in irrigation and the disciplining of subjects into 'normalized' irrigation professionals. These two processes are visible in the 'show' of data on irrigation in Nepal, which I have coined the ritual display of P/ASTHA. In terms of the first process, P/ASTHA reflects the views, aspirations and desire of irrigation professionals in Nepal, namely to see – and for others to see – irrigation development as a matter of hectare coverage and system construction. More specifically, P/ASTHA reflects the engineering view (and desire) that irrigation systems are defined by the use of one source of water (surface or ground water), by the application of one type of technology (canals, wells or small irrigation techniques), and by the idea that systems are meant to irrigate a stipulated area of hectares. In terms of the second process, P/ASTHA structures the experience of irrigation professionals. Data on irrigation appeals to irrigation professionals and produces in them the habit to see irrigation development in terms of hectares and systems, invoking in them a process of developing justifications (and counter-justifications) for normal professional performance. Illustratively, the self-critique of irrigation engineers and water professionals in Nepal that data on irrigation have strong engineering biases and that irrigation development should not be measured in hectares, is essentially a counter justification that is produced through the ritual display of P/ASTHA. The effect is that the discussion in irrigation is structured in a particular way and focusses mainly on the practice of assigning hectare targets to the DOI – not on the way how statistics enact particular irrigation realities of 'projects' or 'systems', or how statistics function in sustaining the views, voices and identities of irrigation professionals.

For clarification, the practice of assigning hectare targets to the DOI is usually discussed in its rational (and strategic) dimensions. It is argued, for example, that hectare targets continue to be put in policy because irrigation engineers have strong incentives to focus on canal construction (and canal coverage) in their profession. I am arguing that the practice also has non-rational (and non-strategic) dimensions. The use and presentation of data on irrigation is also a matter of ritual and stylized behaviour, shaping the views and capacities of irrigation engineers and water professionals for action in a subconscious and liminal state.

In regard to the analytical approach in this chapter, it is worth pointing out that the performativity of data on irrigation only can be discussed and made visible by constructing 'alternative' performances of method. The analysis in Chapter 6, in fact the whole thesis, is a cultural performance of method itself – not just a technical performance of academic research. More specifically, Chapter 6 shows three performances of irrigation data in Nepal, casting three realities or knowledges of irrigation as credible: (1) the performance of mainstream data on irrigation through the display of numbers in tables and graphs, using (and appealing to) the datasets of the DOI, ADB and CBS as a reference; (2) the performance of a critique on irrigation data through the presentation of a four-layered analysis of farmers' experiences in the field, using (and appealing to) field studies and anthropological accounts on irrigation as a reference; and (3) the performance of a feminist investigation into mainstream irrigation data through the show of graphs and tables on the role of foreign funding, executing agencies and policy elites in irrigation, using (and appealing to) an analysis of the datasets of the DOI and the ADB as a reference. I am writing 'appealing to' here because the act of making a reference to datasets itself is a performance, enacting a hinterland of networks and ideas as Law (2009) calls it. For clarification, the rationale of constructing multiple performances is not to say that data on irrigation in Nepal are false or that data collection can be improved. It is to show that realities or knowledges of irrigation subsist alongside each other and to expose that some displays of knowledge in irrigation prevail over others (the mark of hegemony). The performativity of irrigation statistics – the ritual display of P/ASTHA – can thus be considered an enactment (or cultural expression) of normal professional performance in irrigation and perhaps than also, as an expression of the masculinities associated with it. As I have shown, the production of data on irrigation is an international, intercultural practice, between experts from various countries and organisations, and it also is a cross-gender practice, between men, women and people from various ethnic backgrounds, but we should not forget that it mainly have been male experts who have been involved in it.

8.3.2 Dealing with "our" masculinities: Performing irrigation expert knowledge

Building on Chapter 6, the analysis in Chapter 7 presents a further investigation into the dominant experience – in Victor Turner's words – in irrigation expert knowledge. For this purpose, I have acknowledged my subjectivation as an irrigation professional and my position of being a member of the knowledge and policy elites in development, and I conceptualized the diverse and broad body of knowledge that 'we' as 'our knowledges'. To re-iterate, this is not to say that there is only one form of knowledge, but to acknowledge that 'we', as engineers, professionals and researchers, are deeply associated with 'our knowledge ourselves' (Wilson, 2008). In Nepal, an enduring experience in irrigation knowledge can be traced back to the first-generation irrigation engineers and state planners in Nepal and the international experts who cooperated with them (see Chapter 6). In Chapter 7, based on an analysis of 60 years of state irrigation interventions in Chitwan District, I have tried to investigate the high-modernist origins of that experience in more detail, also to explore how foreign ideas on irrigation and water resources development have been 'reworked from within' by local actors and to see how professional performances in irrigation have developed since then – as visible in policy documents, field studies, literature, photos, maps and in other attributes of our knowledges. The result is an empirically rich chapter, presenting a fresh look at Tharu irrigation in Chitwan before the 1950s and highlighting the role of the RVDP in the establishment of a hydraulic mission in Nepal – a term that I used to describe some of the qualities of an experience that structures our knowledges in irrigation. I re-constructed a historical account of irrigation in Chitwan as a self-portrait of changing expert thinking in irrigation (with many self-portraits within it), creating a mirror for self-discovery and searching for masculinities of ‘ourselves’ that might be implicated in our knowledges. Some of the performances of masculinity in the past have been brought (back) into existence through the show of photos, displaying shared experiences and positive self-identities of rulers, farmer leaders, state planners, engineers and other professionals ‘in action’, often in relation to ‘their’ projects.

The work in Chapter 7 is an explorative study and much work remains to be done to make the linkages between hegemony, knowledge and professional performance in irrigation expert thinking more explicit. As the performance of P/ASTHA in irrigation data in policy already suggested, the performance of irrigation expert thinking is one of ‘projectness’ or ‘systemness’ as I have shown through the self-portrait. Performances of projectness in our knowledges rely (in part) on the silencing of ‘other realties’, which then are difficult to make visible. This can be conceived as a mark of hegemony. As noted, with a new hegemony, views on knowledge change and a new experience of reality is brought into existence. Chitwan changed in our knowledges in the 1950s from a place with difficult health and agricultural conditions, seen as an area mainly suitable for large game hunts, to a place with great resource potential and of (future) modernity. In this new experience of reality – a new bikas hegemony – the Tharu were seen as ‘backward’ people and their practices in agriculture considered ‘wasteful’ and ‘inefficient’, while not so long ago, they were perceived by the state as valuable pioneer cultivators who could turn jungle areas in productive agricultural lands in the Terai. This is an example how certain realities are ‘silenced’ and how we tend to forget about them. This is a valuable lesson for research in irrigation expert knowledge on masculinities. It suggests that the invisibility of masculinities in our knowledges is not only a matter of gender being considered as not belonging to the domain of what needs to be explained in irrigation knowledge, it also appears to be a matter of ‘not being able’ to see or conceptualize where and how it is related to our knowledges. In short, the enactment of projectness in irrigation expert thinking appears so encompassing and persuasive, that we lose (some of) our capacities to see or imagine alternative forms of knowledge and experience.

(Re)gaining some of that capacity – and that is essentially what I tried to achieve in Chapter 7 – requires performing and negotiating masculinities in irrigation expert thinking. This appears paradoxical: performing and enacting masculinities in an effort to make them visible. It also appears a dubious research method: to document and construct evidence of masculinities while bringing them into existence myself. As I have noted, however, there is no other way. Masculinities are a situated phenomenon and they only can be documented, discussed and debated from a subject position – in this case the position of myself as a male researcher and water professional. In constructing an irrigation history of Chitwan, I (also) have negotiated my professional performance as a capable researcher, as a man of worth, who has in-depth knowledge of a particular subject, creating a positive self-identity of myself as a researcher and with it, the legitimacy to speak and pursue inquiries, also in domains that are not directly related to the act of constructing an irrigation history itself. The selection of Chitwan for study – one of the most researched districts in Nepal – has been a strategic act to create a safe ground for myself as a (male) researcher. Strategic in the sense that much already has been said on development in the district and a new perspective (for instance on masculinities) is not likely to challenge hegemonic representations of our knowledges in Nepal. In this perspective, the effort that I put in Chapter 7 is a living example of a water professional who has acted as an intermediary and negotiator of knowledges and masculinities.

8.4 Self-reflections on performances of masculinity in research

As noted, research on men and masculinity necessarily is partial and contested, because it starts from the recognition that gender performances are socially constructed, temporal and situated. Sharing self-reflections provide research with a strong objectivity in Harding's words (1991). I have structured my self-reflections in four main points.

1. My masculine identity and access in research on men and masculinity: In my experience, I have a robust masculine identity or better to say, it is very easy for me to act masculine. This is because of my bodily physique – I have a lean, muscular and healthy body, almost two meters tall and a Caucasian appearance – and also because I have acquired, through interaction with male and female role models and peers, the whole gamut of habits, gestures, attitudes, facial expressions and other cultural practices that mark the masculinity of a normal, young, educated, middle-class man in Dutch society. In almost every way, I fulfil the (hegemonic) norm of masculinity: I am married with 'my wife' (and thus I publicly display heterosexual desires), I pursue employment and I drink beer and play sport with male friends in the weekend. Being a man or better to say, having such an embodied experience of masculinity, is an asset for doing research on men and masculinity in irrigation, because it gives access to male networks, also in intercultural settings, based on an assumed sharing of manhood identity. Being a male researcher, (initially) nobody asks why you are talking to other men, gaining critical opportunities to build relations of trust and friendship necessary for reflexive interviews. Also as man among men, assumed stereotypical male behaviour like bragging about your achievements, making sex jokes and drinking raksi (liqor) can function as common cultural meeting points, facilitating interaction and cooperation for research.

2. My masculine identity and self-reflection: Sharing self-reflections on personal behaviour and identity is critical for research on men and masculinity, but this is precisely the skill that men tend not to learn and seek to avoid doing. This is particularly true for men who live up to the hegemonic norm of masculinity – the (highly) educated, Caucasian, heterosexual man in

Dutch society. The reason is simple. They hardly are confronted with their gender identity, because they are associated with whatever is considered the norm in society and they have the most privileged access to education, employment and career opportunities. There also is another simple reason for these men to avoid self-reflection (in my view). Sharing self-reflections and talking about oneself is associated with self-doubt and interpreted by these men as a sign of weakness and uncertainty. Sharing self-reflections among other men, particularly in the presence of women, directly implicates and calls into question 'his' masculinity and 'his' (professional) credibility. It is an activity for these men that can have significant cultural 'costs' (see Cleaver, 2002). This also is true for me, 'being' a (highly) educated, Caucasian, heterosexual man myself. Like any other man, I also have to legitimize 'my' performance in the gender hierarchy and presumably I would have refrained from doing this study if my masculinity would have been at stake in any serious way. With hindsight, I only can thus say that I have been prepared to do self-reflection – and I know that my (female) supervisors like this capacity in me – because I have always felt confident (enough) to talk about my personality and masculinity. I always have felt that my masculine identity was (and is) robust enough and also, that I could easily reconcile 'my' performance with norms of hegemonic masculinity. Seemingly paradoxically, sharing self-reflections and doing this research has thus not challenged 'my' masculinity. On the contrary, it has offered me opportunities to boost 'my' masculinity. I admit that I have become more sensitive to gender issues in the process of this research, but so do other men when they get older.

3. Boosting my masculine identity, being flattered (by feminists): One way that allowed me to boost 'my' masculinity in this research has been that I felt flattered by my senior, female supervisors, other female researchers and an occasional male colleague. One of my senior, female supervisors (Dr. Margreet Zwarteveen) called upon my maleness in 'her' pursuit to investigate the associations between professional performance and masculinities in irrigation. She was looking for 'a man' who was confident enough to investigate masculinities and informed whether I was interested. I replied that I was, and eventually I was hired for the position. This sequence of events confirmed my masculine identity as a 'real man' in two ways. First, the act of 'being asked' appealed to me in the sense that I associated it with a request 'for help' – a harmless and natural question for a man like me as I perceived it. Second, being hired as a man and specifically for my masculine identity, to fulfil a salaried position at a world-class research institution, provided a more than overt opportunity to confirm my status as a 'real man' in Dutch society. Furthermore, the topic of gender equity and social justice in relation to development – the reason for studying men and masculinities in irrigation as I perceived it – appealed to my sense of knighthood and chivalry, 'fighting' for the 'good cause' in pursuit of noble, elitist and hopelessly unrealistic ideals. As a Don Quixote, fighting windmills, I associated the job with courage, hardship, adventure and missionary work – a quest that other man saw (and see) as impossible to pursue – bestowing on me a potentially heroic status. The fact that I received numerous remarks and jokes from male peers on my involvement in gender studies, hinting at my performance as a brave and silly man, suggests that this perception was (and is) broadly shared among male researchers.

4. Boosting my masculine identity, doing a PhD: Also in other ways, this research has been an opportunity to boost 'my' masculine identity. Like in Nepal for engineering studies, pursuing higher education and PhD studies constitutes a privileged roadway for becoming a member of the bureaucratic intelligentsia and the national elite in the Netherlands, particularly for boys (and girls) of middle-class families. More specifically, PhD studies provide for membership in the elitist COP of the academic community, bestowing a high cultural status on the graduate and thus functioning simultaneously as a promising roadway for boys (and girls) to become a man (or woman) of standing in the family-society sphere. Similarly for students and professionals in engineering in Nepal, higher education and academic employment in the Netherlands provides students with ample opportunities to perform up to professional standards and learn about hegemonic norms of masculinity. Participation in the informal milieu of academia in the Netherlands and in the community of development practitioners in Nepal, allowed me to engage in acts of self-normalization – an opportunity to acquire and confess to the appropriate professional pleasures and display the expected performances of success, also learning about the associations between professional performance and masculinities in the process. Education and PhD studies in particular have enabled me to undergo transitional performance. As for engineers in Nepal, the years of academic training and PhD study 'in the field' have been rites of passage *in becoming someone else* – from a boy to a man and from a man to a professional. I underwent my academic training and PhD study as an intense experience – as a (research) 'journey' – associating it with hardship, frustration and strong self-doubt, and also with pure possibility, joy and playfulness. With hindsight, the liminality of 'my journey' allowed me to explore the potentiality and transitions of professional performance and masculinities in irrigation, 'playing out' identities like the 'White Western Bt Cotton Expert', 'Dr. Jan the Gender Man' and 'Thagu' in India and Nepal. It is through such an 'anthropology through experience' that I have acquired a 'gender authentic' performance in the academic community of development and irrigation science – as a male researcher whose 'natural' pleasure and 'inward' passion is to 'capture' gender issues in irrigation as precisely as possible. These pleasures are related to a project of control in science, a project with plain masculine connotations, making science a practice that I am not always happy with but (also) making the pursuit of a PhD an opportunity to boost 'my' masculine identity as a water professional in Dutch society.

8.5 Further and future research

The goal of this thesis has been to identify the associations between professional performance and masculinities in irrigation in an attempt to come to grips with the masculine subject in development policy and research. To my knowledge, my study is one of the few attempts to investigate the associations between professional performance and masculinities in the South; most studies on this topic focus on the West. A first recommendation for future research is then, not surprisingly, to do more research in professional cultures on masculinities in the development context of the South. This basically is a new field of study. More specifically, for further inquiries into the masculine subject in development, there really is a need for more feminist-inspired historical research in Nepal. The re-construction of irrigation development in Chitwan and of irrigation expert thinking in Nepal can be considered an example, contextualizing ideas and projects and making visible some of the men who have been involved in it. There also is a need for critical feminist readings of histories of institutions in the South. The histories of engineering education, professional associations and the DOI in Nepal are examples, showing that performances of masculinity and femininity are not simply the domain of the individual, but embedded in structures of organisations and in society. Such feminist readings of history literally clear the ground for further research on masculinities.

Equally important is to start scrutinizing masculinities in international institutions that are active in the development arena, or more specifically in the COP of the Irrigation Organisation, such as lending agencies, consultancy firms and technical universities. Representatives of these institutions, it appears predominantly men, have travelled (and continue to travel) the globe, and these institutions have played a big role in the construction of (irrigation) development professionalism. Many of these institutions, particularly those based in the West, have long histories of gender discrimination and male hegemony – often more than in the South. An apt example is my own employer organisation, Wageningen University, a Western institution with world reputation and with staff having travelled (and travelling) to almost any country in the world, but also an organisation with a long history of gender discrimination (van der Burg and Bos-Boers, 2003; Lebbink *et al*., 2013). In short, there is a need for feminist historical research on these institutions and also, on some of the men who have been representing these institutions as influential globe trotters, because their masculinities have counted (and continue to count). In my view, this body of research work also should more deliberately, try to scrutinize and de-construct international promotional actions of science, technology and engineering – the promotion of competitive exams, blind selection committees, standard application procedures – to show that actions based on claims of rationality, impartiality and meritocracy (also) reproduce inequity and unfairness.

In further studies on masculinities, particularly when it aims to investigate masculinities (and femininities) at the level of professional interaction and in the domain of (irrigation) knowledge and technology, it is pertinent to approach masculinities as an intercultural phenomenon – as something that is situated and performed in located contexts but also as something that crosses organisational, national and cultural borders. The challenge is really to understand how localized performances of masculinity, like those of the Irrigation Engineer in Nepal, co-construct and depend on performances of (Western) hegemonic masculinity, and how masculinities, in all their diversity change and are sustained across borders of households, communities, and institutions – as a cross-cultural phenomenon. Two focus points can be identified here. First, also scrutinize performances of masculinity in the family-society sphere in research in professional or engineering cultures on masculinities, and analyse how associations between professional performance and masculinities are changing and being sustained within the boundaries of the family – not only within the boundaries of a profession. Second, related to a point mentioned above, (also) focus on the most successful or high-level professionals in the field, who typically travel far and wide and operate in professional elite networks. Research and policy (re)modelling in development is increasingly concentrated and controlled in exclusive networks of different, but distinctly Northern and international institutions and actors – also in the field of irrigation and water professionalism (Laurie, 2005; Rap, 2007; Singh *et al*., 2014). These exclusive 'professional' networks are characterized by highly personalized cultures of interaction in conferences and e-mail, and not surprisingly, they tend to be controlled by men who hold key positions in research, policy and government institutions, travelling the globe to share and promote 'their' knowledge. The gendered concentration of knowledge and power in development and the role of masculinities in it, can only be studied when masculinities are understood as an intercultural phenomenon. In both focus points, the question of access is important. In relation to masculinities in the family-society sphere, it may imply to approach research on masculinities among irrigation engineers and water professionals from a different angle, taking their class and caste group as an entry point – not the professional field or organisation they work in. In relation to masculinities in exclusive research networks, it really is a case of being able to 'get in' and build-up a report with one (or more) high-profile professionals. In the latter case, a research budget should accommodate extensive air-flight travelling to 'follow the professional'.

This thesis has not explored how the findings on masculinities in professional interaction and in expert knowledge in irrigation, as documented in this manuscript, relate to the body of reflexive literature that is produced by irrigation engineers and water professionals themselves. This is an important area for further research. In engaging with farmers and actors in other knowledge fields, and with water users whose livelihoods depend on access to water, irrigation engineers and water professionals can be seen to reflect a lot on 'their' professional practice, today as well as in the past. In Nepal and elsewhere, the science of irrigation and water knowledge has developed into a scholarly field since the 1980s, and researchers, engineers, consultants and other professionals have all contributed with critical reflections. To give some examples of this work: see Diemer and Slabbers (1992); Levine (1992; 2013); Shivakoti and Ostrom (2002); Vuren and Vincent (2009) for civil and agricultural engineers and social scientists in the university setting whose professional field is in irrigation; and see

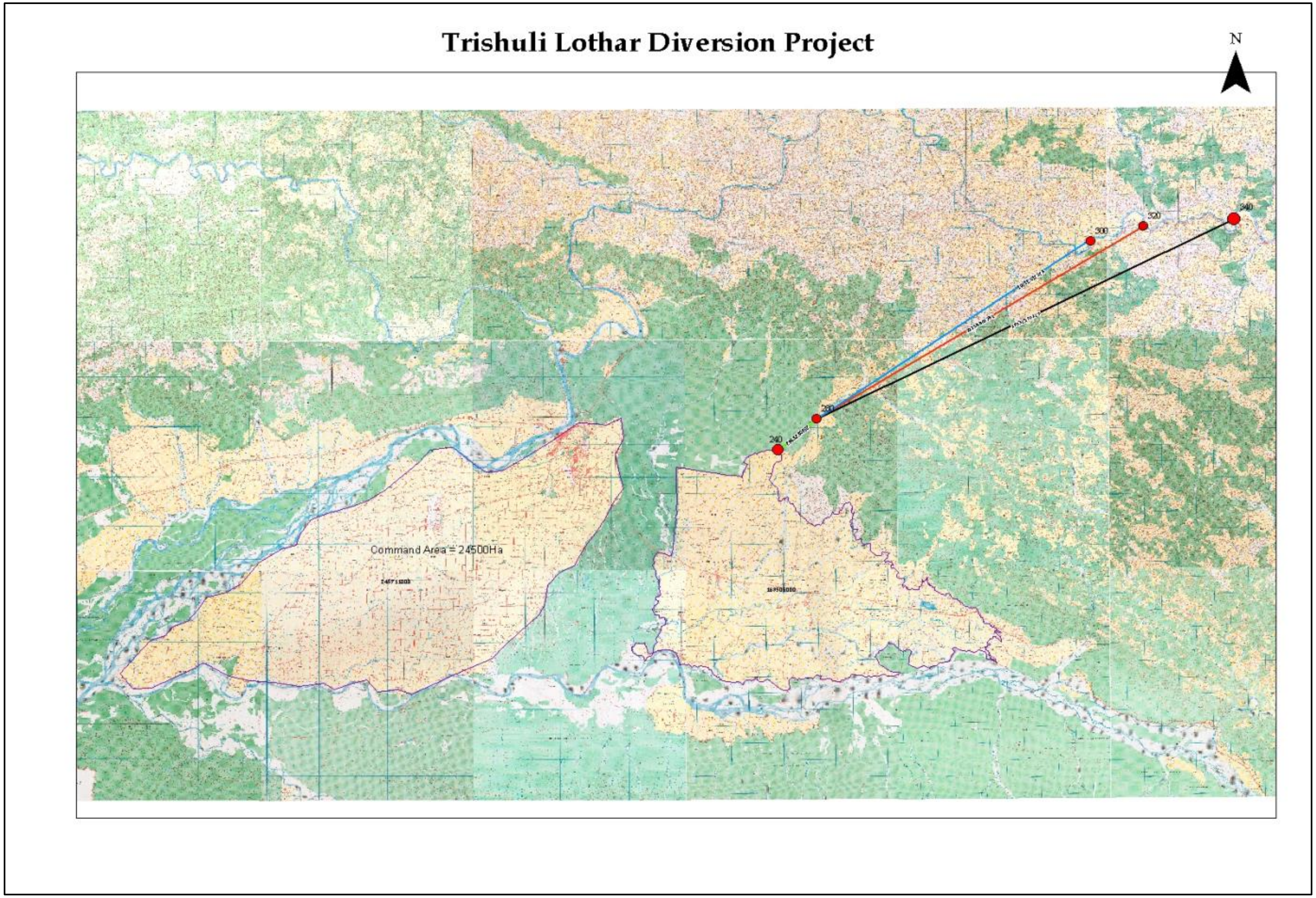
Sharma (2004); Dhungel and Pun (2009); Gyawali (2009; 2013) for (retired) engineers in government service in Nepal who have engaged with the field of irrigation in careers that span over 40 years. In taking this body of work into account, future research can perhaps best start from the observation that it takes into account a wide range of topics and perspectives; politics, ecology, equity and democratic concerns, the sociology of bureaucracies, the mind-set of engineers, a professional culture of construction, ethical dilemmas, community participation and gender at the grassroots level – to name a few; but also that there is hardly anything written on men and masculinities in irrigation, nor on professional identities and very little on self-reflections (to be distinguished from 'reflections' on professional practice). If it is mentioned, it is described as an anecdote or occasional observation ('all engineers were men') – not as something that we need to think about or as a topic that is seen as important to reflect upon. Engagement with this literature is important, however, because supporting it also may help to build a critical interpretative tradition of knowledge seeking in irrigation – one in which the topic of men, masculinities and professional identities is seen as part of discussions on ecologyl, and equity and democratic concerns in irrigation development.

One way, perhaps, to pursue research in this area, in relation to irrigation expert knowledge and its associations with masculinities, is a critical investigation of maps. Maps come in various forms and shapes, following different design criteria and serving different purposes. Generally, maps are powerful 'performative' technical representations of reality, and they can be conceived to function as the ultimate projects of hegemony in science and technology. In their simplicity and uniformity, maps provide a visually rich snapshot of reality in a manner words can rarely achieve. Maps have the power to transform as well as merely summarize the facts that they portray, its value lying in its abstraction and universality – schematic, general and uniform – meaning that the same objective standard can be applied elsewhere (Scott, 1998). The skilful use of well-drafted maps can be used to win over opponents and doubters, answering to popular appeal and attracting public interest (Reuss, 2008). Maps are made and imagined not only by their 'authors' but also by their 'readers', who re-make and re-image as they read (and become 'authors' in turn) (Klingensmith, 2007). More specifically, it appears that the use of maps in development thinking traditionally has enabled Nepalese and Western men to participate in the same heroic and grandiose interpretations of development and foreign assistance. In following cartographic conventions and creating universal legibility, maps appear to function as living projects of hegemony in our knowledges. Scott (1998) argues that the presentation of reality or future has to pass the visual test of modernity; a map has to satisfy the 'high-modernist aesthetic' which embodies a set of hegemonic ideas about technical and scientific practice. In short, maps do not just yield utilitarian simplifications but also express a new cultural unity. If this is true, it can be hypothesized that a gender politics is embodied in 'our maps' – locked into the aesthetic commitments of high-modernism.

To show what such an analysis of maps may look like, I conclude this thesis with a small anecdote, relying on the performativity of a map to perform as a cliff-hanger for further research. At October 22, 2010, I participated in a seminar of the INPIM/N network in Nepal. I had come to listen to a senior divisional engineer and regional director of the DOI who I had interviewed. His presentation was on ‘Inter-basin Water Transfers in Nepal’ and he discussed the conceptualization of 7 inter-basin diversion projects of the DOI. Key of the projects was the focus on ‘medium and small’ rivers within the territory of Nepal, given the difficulties of water resources development in the Karnali, Gandaki and Kosi rivers. The presentation contained numerous maps of preliminary studies, showing points of diversion, possible tunnel alignments and proposed irrigation command areas of the projects. One of these maps was on the Trishuli Chitwan Diversion Project (see Figure 8.1). The Trishuli river is a tributary of the Narayani or Gandaki river. The map shows possible intake points and alignments of a 30 km long tunnel and an envisioned command area of 24.500 ha, covering all the area in West and East Chitwan.

The map was presented in an audience of about 30 persons which consisted mainly out of senior DOI engineers, among them three ex director generals of the DOI, including the Water Emperor, and representatives of academia and other water research institutions in Nepal (e.g. *NEC*, IWMI). The presentation dealt mainly with technical intricacies of the projects (e.g. tunnel alignment, elevation profiles, design discharge, hydrographs, command area), but it nevertheless got across a grand vision on irrigation and water resources development in Nepal in which the role of the state was made explicit at the end of the presentation. First of all, it was mentioned that more (engineering) ‘manpower’ is required to implement the projects. It also was stated that the government of Nepal ‘lacks’ an agency for the implementation of multi-purpose projects and it was proposed to restructure the Ministry of Irrigation as the custodian of water resources in Nepal and be named as the ‘Ministry of Water Resources’. Under this ministry, it was suggested to establish a new department, the ‘Department of Water Resources’ to lead the construction of hydropower plants and irrigation projects larger than 10.000 ha, and to institutionalize an ‘International River Cell’ in the WECS to resolve water sharing issues with India. It also was advised to set up an ‘Institute of Water Resources’ under Tribhuvan University, to train human resources for the new ministry and department.

Figure 8.1: Breathing life into the Trishuli Lothar Diversion Project



Source: INPIM/N talk programme, 22 October 2010.

The presentation of this map awakened in me a sense of deja vu. State irrigation projects in Chitwan in the 1950s, 70s and 90s also appear to have been brought into existence through the production and display of maps – summarizing the facts that they display and showing what can be achieved by state planners and engineers. Putting them in sequence, they seem to reflect and structure an experience in irrigation expert knowledge that resembles a robust version of a hydraulic mission in Nepal. It also occurred to me that DOI engineers and the broader community of experts who supported their plans, much like their predecessors were designing projects 'top down' based on a strong faith in scientific and technical progress and the rational design of social order, using mainly technical criteria and having a seemingly 'blind eye' for existing water use practices. At the same time, I realized that it was the map itself, that made these reflections possible. The map is thus as a textbook example of projectness or systemness, enacting our knowledges according to 'fixed' patterns but also enabling us to reflect upon them and make changes. In the context of the INPIM/N meeting, the map (also) breathed new life into masculinities among irrigation engineers and water professionals, reproducing gender inequities in the profession, but at the same time, and simultaneously, it enabled the exploration of new positive self-identities and alternative shared experiences in the profession of irrigation engineering and water management.

References

Acker, Joan. 1990. Hierarchies, jobs, bodies: A theory of gendered organisations. *Gender and Society*, 4: 139-158.

Adams, A.E. 1982. *Chitwan irrigation project. The Lothar sub-project. Interim report – January 1982.* Essen, Germany: Agrar- und Hydrotechnik GMBH.

ADB. 1972. *Appraisal of Chitwan Valley Development Project in Nepal.* Manila, the Philippines: Asian Development Bank (ADB).

ADB. 1977. *Appraisal of supplementary loan proposal for the Chitwan Valley Development Project in Nepal.* Manila, the Philippines: Asian Development Bank (ADB).

ADB. 1987a. *Appraisal of East Rapti Irrigation Project in Nepal.* Manila, the Philippines: Asian Development Bank (ADB).

ADB. 1987b. *[Loan processing activities]. East Rapti Irrigation Project.* Manila, the Philippines: Asian Development Bank (ADB).

ADB. 1990. *Project completion report of the Chitwan Valley Development Project [Loan nos. 114, 310 and 694-NEP(SF)]*. Manila, the Philippines: Asian Development Bank (ADB).

ADB. 2012a. *Irrigated agriculture and water resources component.* Preparation of the Nepal agriculture water resources strategy. Manila, the Philippines: Asian Development Bank (ADB).

ADB. 2012b. *Assessment report. Preparation of the Agricultural Development Strategy*. Manila, the Philippines: Asian Development Bank (ADB).

ADB/Agrar. 1972. *Chitwan Valley Development Project, Nepal*. Studies. Manila, the Philippines: Asian Development Bank (ADB) and Essen, Germany: Agrar- und Hydtrotechnik GMBH (Agrar).

ADB/APROSC. 1990. *Agricultural Sector Strategy of the Eight Plan (1990-1995). Irrigation*. Manila, the Philippines: Asian Development Bank (ADB) and Kathmandu, Nepal: Agricultural Project Services (APROSC).

ADB/Multi. 1986. *PBME* [Project Benefit Monitoring and Evaluation] *Benchmark survey East Rapti Irrigation Project, Chitwan, Nepal.* Manila, the Philippines: Asian Development Bank (ADB) and Kathmandu, Nepal: Multi-Disciplinary Consultants (Multi).

Adhikari, Deepak. 2006. Hydropower development in Nepal. *Nepal Rastra Bank Economic Review*, 18 (article 4): 70-94.

Adhikari, Keshav R. 2001. *Diagnosis of the East Rapti river basin of Nepal: A country paper*. Paper prepared for presentation at a workshop on ‘Developing Effective Water Management Institutions’, East Java, Malang, Indonesia, 15-19 January 2001. Rampur, Nepal: Institute of Agriculture and Animal Science.

Adhikari, Keshav R.; B.D. Manandhar and N.R. Joshi. 2002. *Report on process documentation study of Panchakany Irrigation System.* A collaborative research programme of the Institute of Agriculture and Animal Science and the Irrigation Management Transfer Project. Rampur, Nepal: Institute of Agriculture and Animal Science.

Adhikari, Keshav R.; Yih-Chi Tan, Jihn-Sung Lai and Dhruba Pant. 2009. Irrigation intervention: A strategy for conserving biodiversity and improving food security in royal Chitwan national park buffer zone, Nepal. *Irrigation and Drainage*, 58: 522-537.

Adhikary, Milan. 1995. *Women graduates in agriculture and forestry development in Nepal*. Research report series no. 33, Policy Analysis in Agriculture and Related Resource Management. Kathmandu, Nepal: Winrock International.

Agrawal, Nanda Kishore. 1976. *Water resources development with reference to irrigation in Nepal*. Paper presented at 'Symposium on water and energy resources development', Kathmandu, Nepal, 23-25 November 1976. Kathmandu, Nepal: National Water Resources and Energy Commission and United Nations Development Programme.

Agrawal, Nanda Kishore; and L.P. Agrawal. 1976. Operation and maintenance of irrigation facilities. IN: HMG-N/FAO. *Water management and control at the farm level*. Proceedings of a national seminar, Kathmandu, Nepal, 8-13 March 1976. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Bangkok, Thailand: Food and Agricultural Organisation (FAO).

Agrinaut. 1967. On irrigation. Prospects and problems. *The Rising Nepal*, 8 June 1967: 3.

Alden-Wily, Liz; Devendra Chapagain and Shiva Sharma. 2009. *Land reform in Nepal. Where is it coming from and where is it going?* Kathmandu, Nepal: Department for International Development.

Ambrose, Linda and Margareth Ketchnie. 1999. Social control or social feminism: Two views on Ontario women's institutes. *Agricultural History*, 73 (2): 222-237.

Angrosino, Michael V. 2002. Conducting a Life History Interview. In: *Doing Cultural Anthropology: Projects for Ethnographic Data Collection*, 33-44. Long Grove, US: Waveland Press.

Ansari, N.; and Prachanda Pradhan. 1991. *Assistance to farmer managed irrigation systems: Experience from Nepal*. Papers presented in the seminar on 'Improving Farmer Managed Irrigation Systems: Experiences of different Agencies and Organisations', Kathmandu, Nepal, 27 June 1990. Kathmandu, Nepal: Ministry of Water Resources, Department of Irrigation.

APROSC. 1978. *Irrigation impact evaluation study (Khageri Irrigation Project).* Kathmandu, Nepal: Agricultural Projects Services Centre (APROSC).

APROSC/ADC. 1978. *Water management and control at the farm level in Nepal*, Report of a seminar, Kathmandu, Nepal, 25-27 October 1978. Kathmandu, Nepal: Agricultural Projects Services Centre (APROSC) and Agricultural Development Council (ADC).

Arce, Alberto; and Norman Long. 2000. Reconfiguring modernity and development from an anthropological perspective. In: Alberto Arce and Norman Long (eds.). *Anthropology, development and modernities: Exploring discourses, counter-tendencies and violence,* chapter 1: 1-31. New York, US: Routledge.

Armato, Michael. 2013. Wolves in sheep's clothing: Men's enlightened sexism and hegemonic masculinity in academia. *Women's Studies: An Interdisciplinary Journal*, 42 (5): 578-598.

Arts, Bas; Jelle Behagel, Séverine van Bommel, Jessica de Koning and Esther Turnhout (eds.). 2013. *Forest and nature governance. A practice based approach.* Dordrecht, the Netherlands: Springer.

Arts, Bas; and Pieter Leroy (eds.). 2006. *Institutional dynamics in environmental governance*. Dordrecht, the Netherlands: Springer.

Aubriot, Olivia. 2004. Irrigation history in central Nepal: The interface between agriculture and technology. *Water Nepal*, 11 (2): 19-43.

Axinn, N.W. 1988. Gender related issues in international development assistance for agriculture and rural life. *Agriculture and Human Values,* 5 (1-2): 69-76

Baidya, Huta Ram. 1968. *Farm irrigation and water management. Principles and practices.* Kathmandu, Nepal: Royal Nepal Academy.

Bajracharya, D.B. 1990. Role of organisers in assisting farmer-managed irrigation systems: The case of the Agricultural Development Bank of Nepal. In: Shaul Manor, Sanguan Patamatamkul and Manuel Olin (eds.). *Role of social organisers in assisting farmer-managed irrigation systems,* 61-66. Colombo, Sri Lanka: International Irrigation Management Institute (IIMI).

Bajracharya, Deepak. 1983. Deforestation in the food/fuel context: Historical and political perspectives from Nepal. *Mountain Research and Development*, 3 (3): 227-240.

Bajracharya, J. 1991. *Women farmers' involvement in agricultural research in Nepal.* PAC Occasional Paper no. 10. Dhankuta District, Nepal: Pakhribas Agricultural Centre (PAC).

Balwant, Singh Nag. 1950. *Kosi dam project.* New Delhi, India: Government of India, Central Waterpower, Irrigation and Navigation Commission

Basnet, Kachan. 1992. *Conjunctive use of ground and surface water for irrigation: Case study of an irrigation system in the Terai of Nepal*. MSc Thesis. Cornell University, US.

Bee, Kathleen M. 2003. Contending with disciplinarity. In: Robyn Wiegman (eds.). *Women's Studies on its Own*, 177-182. Durham, US and London, UK: Duke University Press.

Behagel, Jelle. 2012. *The politics of democratic governance. The implementation of the Water Framework Directive in the Netherlands*. PhD Thesis. Wageningen University, the Netherlands.

Belbase, Madhav. 2010. Challenges in financing irrigation systems. In: DOI. *Challenges in irrigation development and management*, 154-164. Proceedings report of the National Irrigation Seminar, Kathmandu, Nepal, 11-12 July 2010. Kathmandu, Nepal: Department of Irrigation (DOI).

Benjamin, Paul; Wai Fung Lam; Elinor Ostrom and Ganesh Shikvakoti. 1994. *Institutions, incentives and irrigation in Nepal.* Workshop in Political Theory and Policy Analysis. Bloomington, US: Indiana University.

Bennett, Lynn. 2005 [1983]. *Dangerous wives and sacred sisters: Social and symbolic roles of high caste women in Nepal.* Second re-reprint edition. Kathmandu, Nepal: Mandala Publications.

Bhatta, Pramod. 2005. Decentralization of primary education in Nepal. *Studies in Nepali History and Society*, 10 (1): 3-38.

Bhattarai, Damodar. 2009. Multi-purpose projects. In: Dwarika Nath Dhungel and Santa Bahadur Pun (eds.). *The Nepal-India water relationship: Challenges*, chapter 3: 69-98. Kathmandu, Nepal: Institute for Integrated Development Studies and Dordrecht, the Netherlands: Springer.

Bhattarai, Deepak. 2009. *Engineering education in Nepal: Prospects and challenges in the new environment.* A paper presented at the international conference on 'Making globalization work: The role of consultants', Kathmandu, Nepal, 11-13 March 2009. Kathmandu, Nepal: Nepal Engineering College.

Bista, Dor Bahadur. 1991. *Fatalism and development. Nepal's struggle for modernization.* Calcutta, India: Orient Longman.

Bista, Dor Bahadur. 2004 [1967]. *People of Nepal.* Kathmandu, Nepal: Ratna Pustak Bhandar.

Biswas, Asit K. 1989. Irrigation in Nepal: Opportunities and constraints. *Journal of Irrigation and Drainage Engineering*, 115 (6): 1051-1064.

Boal, Augusto. 2002 [1974]. *Theatre of the oppressed.* Seventh printing. New York, US: Theatre Communications Group.

Bobbink, Wilma; and Ineke Boomsma. 1995. *The other spectacle. Gender. A gender strategy for Mechi Hill Development Programme.* Kathmandu, Nepal: Stichting Nederlandse Vrijwilligers.

Boelens, Rutgerd. 2008. *The rules of the game and the game of the rules. Normalization and resistance in Andean water control.* PhD Thesis. Wageningen University, the Netherlands

Bolton, Melvin. 1975. *Royal Chitwan National Park Management Plan 1975-1979.* National Parks and Wildlife Conservation. Rome, Italy: Food and Agricultural Organisation.

Botrall, Anthony F. 1981. *Comparative study of the management and organization of irrigation projects.* World Bank Staff Working Paper, no. 458. Washington DC, US: World Bank.

Bourdieu, Pierre. 1977. *Outline of theory of practice.* Cambridge, UK: Cambridge University Press.

Bourdieu, Pierre. 1984 [1979]. *Distinction. A social critique of the judgement of taste*. New York, US and London, UK: Routlege.

Bourdieu, Pierre. 1996. Masculine domination revisited. *Berkeley Journal of Sociology*, 41: 189-203.

Bracke, Sarah. 2008. Conjugating the modern/ religious, conceptualizing female religious agency. Contours of a 'post-secular' conjucture. *Theory, Culture and Society,* 25 (3): 1-13

Brandt, Berit; and Marit S. Haugen. 2005. Text, body and tools. Changing mediations of rural masculinity. *Men and Masculinities*, 8 (2): 148-163.

Bruins, Bert; and Annelies Heijmans. 1993. *Gender-biases in irrigation projects. Gender considerations in the rehabilitation of Bauraha Irrigation System in the district of Dang, Nepal.* Kathmandu, Nepal: Self-published.

Burg, Margreet van der. 2002. *'Geen tweede boer'. Gender, landbouwmodernisering en onderwijs aan plattelandsvrouwen in Nederland, 1863-1968.* ['No second farmer'. Gender, agricultural modernisation and education for rural women in the Netherlands, 1863-1968]. Hilversum, the Netherlands: Uitgeverij Verloren.

Burg, Margreet van der. 2010. Rural women's voices and the identification of rural women's issues within the landscape of international organisations, 1889-1940. In: W. Ernst (eds.). *Grenzregime: Geschlechterkonstellationen zwichen Kulturen und Räumen der Globaliserung*, 204-226. Berlin, Germany: LIT Verlag.

Burg, Margreet van der. 2014. *Home economics linking agriculture, nutrition and rural development: gendered interrelations of Western development projections into the global context, 1890s till 1970s.* Presented at a conference 'Revisiting the Historical Connections between Agriculture, Nutrition, and Development: The United Nations Food and Agriculture Organization in a Global Context', Basel, Switzerland, 29-30 August 2014. Basel, Switzerland: University of Basel.

Burg, Margreet van der; and Marian Bos-Boers. 2003. *Vrouwen, Wageningen en de wereld. Wetenschap, studie en loopbaan, 1918-2003.* [Women, Wageningen and the world. Science, study and career, 1918-2003]. Hilversum, the Netherlands: Uitgeverij Verloren.

Butler, Judith. 1997. *The psychic life of power: Theories in subjection.* Stanford, California, US: Stanford University Press.

Butler, Judith. 1999 [1990]. *Gender trouble. Feminism and the subversion of identity.* Second edition. London, UK: Routledge.

Callon, M. 2007. What does it mean to say that economics is performative? In: MacKenzie, D., F. Munieza and L. Siu (eds.). *Do economics make markets? On the performativity of economics*, 311-357. Princeton, US: Princeton University Press.

Caplan, Lionel. 1975. *Administration and politics in a Nepalese town. The study of a district capital and its environs.* Oxford, UK: Oxford University Press.

Carbert, Louise. 1995. *Agrarian feminism. The politics of Ontario farm women.* Toronto, Canada: University of Toronto Press.

CBS. 1961. *Agricultural census.* Kathmandu, Nepal: Central Bureau of Statistics (CBS).

CBS. 1971. *Agricultural census*. Kathmandu, Nepal: Central Bureau of Statistics (CBS).

CBS. 1981. *Agricultural census.* Kathmandu, Nepal: Central Bureau of Statistics (CBS).

CBS. 1991. *Agricultural census.* Kathmandu, Nepal: Central Bureau of Statistics (CBS).

CBS. 2001. *Agricultural census.* Kathmandu, Nepal: Central Bureau of Statistics (CBS).

CBS. 2006. *Agricultural monograph*. Kathmandu, Nepal: Central Bureau of Statistics (CBS).

Chambers, Robert. 1988. Normal Professionalism. In: Robert Chambers (eds.) *Managing canal irrigation. Practical analysis from South Asia*, chapter 4: 68-85. New Delhi, India: Oxford and IBH Publishing.

Chanana, K. 2001. *Interrogating women's education: Bounded visions, expanding horizons*. New Delhi, India: Rawat Publications.

Chapagain, P. Devendra. 1972. *Development of agricultural extension service in Nepal.* EAPD Staff Paper no.1. Rome, Italy: Food and Agricultural Organization and Kathmandu, Nepal: His Majesty's Government of Nepal.

Chhetri, Nalini Subba; and Annet Lingen. 1998. *Review on gender in the SNV policy and programme. Final report.* Kathmandu, Nepal: Stichting Nederlandse Vrijwilligers, Nepal and the Hague, the Netherlands: Institute of Social Studies Advisory Service.

Cleaver, Frances (eds.). 2002. *Masculinities matter! Men, gender and development.* London, UK and New York, US: Zed Books and Cape Town, South Africa: David Philip.

Collinson, D.L.; and J. Hearn (eds.). 1996. *Men as managers, managers as men. Critical perspectives on men, masculinities and management.* California, US; London, UK and New Delhi, India: Sage Publications.

Connell, R.W. 2001. The social organization of masculinity. In: Stephen Whitehead and Frank J. Barrett (eds.). *The masculinity reader*, chapter 1, 30-50. Cambridge, UK and Malden, US: Polity press.

Connell, R.W. 2005 [1995]. *Masculinities.* Second edition. Berkeley and Los Angeles, US: University of California Press.

Connell, R.W.; and J.W. Messerschmidt. 2005. Hegemonic masculinity. Rethinking the concept. *Gender and Society*, 19 (6): 829-859.

Conquergood, Dwight. 2002. Performance studies. Interventions in radical research. *The Drama Review*, 46 (2): 145-156.

Coward, Walter. 2005. Property and FMIS governance: Two books that may be unfamiliar, but that inform the discussion. In: Prachanda Pradhan and Upendra Gautam (eds.). *Farmer managed irrigation systems and governance alternatives,* 19-31. Proceedings of the third international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 9-10 December 2004. Kathmandu, Nepal: Farmer Managed Irrigation System Promotion Trust.

Coward, Walter; and Gilbert Levine. 1987. Studies of farmer-managed irrigation systems: Ten years of cumulative knowledge and changing research priorities. In: IIMI/WECS. *Public intervention in farmer managed irrigation systems,* 1-31. Colombo, Sri Lanka: International Irrigation Management Institute (IIMI) and Kathmandu, Nepal: Water Energy Commission Secretariat (WECS).

Coward, Walter; Bruce Koppel and Robert Siy. 1982. *Organization as a strategic resource in irrigation development*. Honolulu, Hawaii, US: East West Centre, Resource Systems Institute.

Cranny-Francis, Anne; Wendy Waring, Pam Stravropoulos and Joan Kirby (eds.). 2003. *Gender studies: Terms and debates.* New York, US: Palgrave.

Crenshaw, K. 2000. *The intersectionality of race and gender discrimination.* Available online: http://www.isiswomen.org/womenet/lists/apgrlist/archive/doc00009.doc.

Czarniawska, Barbara. 1997. *Narrating the organization. Dramas of institutional identity*. Chichago, US: University of Chicago Press.

Czarniawska, Barbara. 2006. Doing gender unto the other: Fiction as a mode of studying gender discrimination in organizations. *Gender, Work and Organization*, 13 (3): 234-253.

Dahal, D.R. 1995. Ethnic cauldron, demography and minority politics. In: D. Kumar (eds.). *State leadership and politics in Nepal*. Kathmandu, Nepal: Centre for Nepal and Asian Studies.

Dahal, Ngamindra. 1997. A review of Nepal's first conference on agriculture. *Water Nepal*, 5 (2): 149-164.

Dangal, Rameshwor. 2005. *Administrative culture in Nepal: Does it reflect the dominant socio-cultural values of Nepal?* MSc Thesis. University of Bergen, Norway.

Davis, Horace J. 1966. The role of the United States Department of Agriculture in assisting agricultural developments in South Asia. In: HMG-N. *Proceedings of agriculture conference II, 1964,* 18-20. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N).

Davis, Kathy. 2008. Intersectionality as buzzword. A sociology of science perspective on what makes a feminist theory successful. *Feminist Theory*, 9 (1): 67-85.

Delamont, S.; and P. Atkinson. 2001. Doctoring uncertainty: Mastering craft knowledge. *Social Studies of Science*, 31 (1): 87-107.

Devkota, Naba Raj. 2003. *Impact of Winrock's Women Scholarship Program, evaluation and suggestions for future program*. Research report, series no.49. Policy Analysis in Agriculture and Related Resource Management. Kathmandu, Nepal: Winrock International.

DFID/WB. 2006. *Unequal citizens. Gender, caste and ethnic exclusion in Nepal. Summary*. Kathmandu, Nepal: Department for International Development (DFID) and World Bank (WB).

Dhungel, Dwarika Nath. 2009. Historical eye view. In: Dwarika Nath Dhungel and Santa Bahadur Pun (eds.). *The Nepal-India water relationship: Challenges*, chapter 2: 11-68. Kathmandu, Nepal: Institute for Integrated Development Studies and Dordrecht, the Netherlands: Springer.

Dhungel, Dwarika Nath; and Santa Bahadur Pun (eds.). 2009. *The Nepal-India water relationship: Challenges*. Kathmandu, Nepal: Institute for Integrated Development Studies and Dordrecht, the Netherlands: Springer.

DHV/APROSC/WB. 1989. *Human resources development study: Irrigation subsector*. Kathmandu, Nepal: DHV consultants (DHV), Agricultural Project Services Centre (APROSC) and World Bank (WB).

DIDW. 1967. *Upper Khageri irrigation project, Rapti valley, volume no 1*. Rapti Valley Irrigation Division. Bharatpur, Nepal: Department of Irrigation and Drinking Water (DIDW).

Diemer, Geert: and Jacques Slabbers. 1992. *Irrigators and engineers. Essays in honour of Lucas Horst.* Amsterdam, the Netherlands: Thesis Publishers.

DIHM/ADB/Nippon Koei. 1985. *Feasibility study on East Rapti Irrigation Project.* Kathmandu, Nepal: Department of Irrigation, Hydrology and Meteorology (DIHM), Asian Development Bank (ADB), Nippon Koei co. Limited (Nippon Koei).

DIHM/Nippon Koei. 1972. *Feasibility study of irrigation development in the Terai plain phase II. Nepal. Final report.* Kathmandu, Nepal: Department of Irrigation, Hydrology and Meteorology (DIHM) and Nippon Koei co. Limited (Nippon Koei).

Dirks, N.B. 2008. *Castes of mind. Colonialism and the making of modern India.* Delhi, India: Permanent Black.

DOI. 1992a. *Chitwan Lift Irrigation System, Chitwan District*. Kathmandu, Nepal: Department of Irrigation (DOI), Irrigation Management and Water Utilization Division.

DOI. 1992b. *Irrigation policy of 1992*. Kathmandu, Nepal: Department of Irrigation (DOI), Government of Nepal.

DOI. 2000. *Request for proposal for the consulting services of Baghmara Lift Irrigation Project, Chitwan.* Kathmandu, Nepal: Department of Irrigation (DOI).

DOI. 2003. *Irrigation policy of 2003*. Kathmandu, Nepal: Department of Irrigation (DOI), Government of Nepal.

DOI. 2008. *Human resources assessment of DOI.* Kathmandu, Nepal: Department of Irrigation (DOI).

DOI. 2011. *Micro to mega: Irrigation for prosperous Nepal.* Proceedings of the National Irrigation Seminar, Kathmandu, Nepal, 13-14 July 2011. Kathmandu, Nepal: Department of Irrigation (DOI).

DOI/CERD. 2007. *Data base for irrigation development in Nepal*. Kathmandu, Nepal: Department of Irrigation (DOI) and Centre for Engineering Research and Development (CERD).

DOI/EAST. 1989. *Training report on orientation to irrigation management (Training conducted for Association Organisers working under IMP at S-DIS, 10-15 September 1989).* Kathmandu, Nepal: Department of Irrigation (DOI), Irrigation Management Centre and East Consult (EAST).

DOI/GEOCE. 1998. *Institutional development of the WUAs in East Rapti Irrigation Project. Assignment completion report.* Kathmandu, Nepal: Department of Irrigation (DOI) and GEOCE consultants (GEOCE).

DOI/ILO. 1992. *Women in development (WID) study for the Nepal SPWP* [Special Public Works Programme] (NEP/90/034) (NEP/86/M02/DAN). Promotional action to incorporate the gender dimension into selected mainstream projects in South Asia. Kathmandu, Nepal: Department of Irrigation (DOI) and International Labour Organization (ILO).

DOI/Manisha. 2001. *Inception report on detailed survey, design and EIA* [Environmental Impact Assessment] *study of Baghmara Lift Irrigation Project.* Kathmandu, Nepal: Department of Irrigation (DOI) and Manisha Engineering Consultants (Manisha).

DOI/Multi. 1997. *Final report for water augmentation to Khageri canal system*. Kathmandu, Nepal: Department of Irrigation (DOI) and Multi Disciplinary Consultants (Multi).

DOI/Multi. 2002. *Final report on pre-feasibility study for Lower Khageri Irrigation Project, Chitwan.* Kathmandu, Nepal: Department of Irrigation (DOI) and Multi Disciplinary Consultants (Multi).

DOI/NC/HES. 1996. *Assess/ compare the status of women's involvement in irrigation system management and water utilization. Practices in IMTP Phase I Sub-project*. Kathmandu, Nepal: Department of Irrigation (DOI), Nepal Consult (NC) and Hydro Engineering Services (HES).

DOI/Nippon Koei. 1989. *Detailed planning report for East Rapti Irrigation Project. Volume 2. Annex A (water balance study). Annex B (related letters).* Kathmandu, Nepal: Department of Irrigation (DOI) and Nippon Koei co. Limited (Nippon Koei).

DOI/Nippon Koei/SILT. 1990. *Report on inventory of existing farmer managed irrigation systems. East Rapti Irrigation Project. Volume 1 (main report).* Kathmandu, Nepal: Department of Irrigation (DOI), Nippon Koei co. Limited (Nippon Koei) and SILT consultancy (SILT).

DOI/SILT. 2001. *Women's role in IMTP* [Irrigation Management Transfer Project]. *Final report.* Kathmandu, Nepal: Department of Irrigation (DOI) and SILT Consultants (SILT).

DOI/WB/UNDP. 1989. *Master plan for irrigation development in Nepal.* Kathmandu, Nepal: Department of Irrigation (DOI), World Bank (WB) and United Nations Development Programme (UNDP).

Donner, Wolf. 1966. *Home science activities in Nepal.* Rome, Italy: Food and Agricultural Organization.

Donner, Wolf. 1967a. *Irrigation in Nepal.* Rome, Italy: Food and Agricultural Organization.

Donner, Wolf. 1967b. *Remarks on Rapti-Valley Development Scheme*. Rome, Italy: Food and Agricultural Organisation.

ECWUCC. 2008. *Report on requirement of 7.00 boom length & 0.60 m3 bucket capacity P.C. 120 hydraulic excavator machine.* Bharatpur, Nepal: East Chitwan Water Users' Coordination Committee (ECWUCC).

Elder, Joseph W. 1975. *Planned resettlement in Nepal's Terai*. Newsletter 1975, no. 50: 24-32. Wisconsin-Madison, US: Land Tenure Centre.

Ely, Robin J.; and Debra E. Meyerson. 2000. Theories of gender in organizations: A new approach to organizational analysis and change. *Research in Organizational Behaviour*, 22: 102-151.

Ensminger, Douglas. 1966. *The Ford Foundation overseas development self-study of the Nepal program*. Kathmandu, Nepal: The Ford Foundation.

ERA. 1973. *Middle-level manpower follow-up study. A study of attrition among middle-level technical personnel in Nepal.* Kathmandu, Nepal: New Education Reform (ERA) Associates.

Ertsen, Maurits. 2005. *Prescribing perfection. Emerging of an engineering irrigation design approach in the Netherlands East Indies and its legacy 1830-1990.* PhD Thesis. University of Delft, the Netherlands.

Esnaarjay. 1966. Women's role in national reconstruction affirmed. *The Rising Nepal*, 9 June 1966: 1.

ESRI. 2001. *Irish social attitudes survey*. Dublin, Ireland: Economic and Social Research Institute (ESRI).

Etzkowitz, H; C. Kemelgor; M. Neuschtz, B. Uzzi; and J. Alonzo. 1994. The paradox of critical mass in science. *Science*, 266: 51-53.

FAO. 1969. *Agricultural development planning*. Report to the Government of Nepal. Based on the work of Dr. Wolf Donner. Rome, Italy: Food and Agricultural Organisation.

FAO. 1973. *Man's influence on the hydrological cycle.* Irrigation and drainage paper, special issue 17. Rome, Italy: Food and Agricultural Organisation (FAO).

FAO. 1974. *Family resources development and family well-being.* Working paper of perspective study of agricultural development for Nepal. Rome, Italy: Food and Agriculture Organization (FAO).

Faulkner, Wendy. 2009a. Doing gender in engineering workplace cultures. I. Observations from the field. *Engineering Studies*, 1 (1): 3-18.

Faulkner, Wendy. 2009b. Doing gender in engineering workplace cultures. II. Gender in/authenticity and the in/visibility paradox. *Engineering Studies*, 1 (3): 169-189.

Faurès, J.M.; M. Svendsen and D. Turral. Reinventing irrigation. In: David Molden (eds.). *Water for food, water for life: A comprehensive assessment of water management in agriculture*, 353-394. London, UK: Earthscan and Colombo, Sri Lanka: International Water Management Institute.

Ferguson, James. 1990. *The anti-politics machine: 'Development', depolitization and bureaucratic state power in Lesotho.* Cambridge, UK: Cambridge University Press.

Ferguson, James; and Larry Lohmann. 1994. The anti-politics machine. "Development" and bureaucratic power in Lesotho. *Ecologist*, 24 (5): 176-181.

Foucault, Michel. 1981. *The History of Sexuality: Volume I.* Translated by Robert Hurley. Harmondsworth, UK: Pelican.

Fraser, Nancy. 1997. *Justice interruptus: Critical reflections on the 'postsocialist' condition*. New York, US and London, UK: Routlege.

Frehill, Lisa M. 2004. The gendered construction of the engineering profession in the United States, 1893-1920. *Men and Masculinities*, 6: 383-403.

Fujikura, Tatsuro, 1996. Technologies of improvement, locations of culture: American discourses of democracy and 'Community Development' in Nepal. *Studies in Nepali History and Society*, 1 (2): 271-311.

Gaasbeek, Timmo. 2010. *Bridging troubled waters? Everyday inter-ethnic interaction in a context of violent conflict in Kottiyar Pattu, Trincomalee, Sri Lanka.* PhD Thesis. Wageningen University, the Netherlands.

Garces-Restrepo, Carlos; Douglas Vermillion; and Giovanni Muñoz. 2007. *Irrigation management transfer. Worldwide efforts and results.* FAO Water Reports 32. Rome, Italy: Food and Agriculture Organisation and Colombo, Sri Lanka: International Water Management Institute.

Gautam, Suman. 2006. *Incorporating groundwater irrigation. Technology, dynamics and conjunctive water management in the Nepal Terai.* Wageningen University Water Resources Series. New Delhi, India: Orient Longman.

Gautam, Upendra. 1989. *The job of association organisers (AOS).* Second draft. Kathmandu, Nepal: Department of Irrigation, Irrigation Management Project.

Gautam, Upendra. 1990. Role of social organizers in improving irrigation management: The experience in Nepal. In: Shaul Manor, Sanguan Patamatamkul and Manuel Olin (eds.). *Role of social organisers in assisting farmer-managed irrigation systems*, 67-75. Colombo, Sri Lanka: International Irrigation Management Institute.

Gee, E.P. 1959. Report on a survey of the rhinoceros area of Nepal, March and April 1959. *Oryx*, 5 (2): 59-85.

Gellner, David N. 2008a. Ethnicity and nationalism in the world's only Hindu state. In: David N. Gellner; Joanna Pfaff-Czarnecka and John Whelpton (eds.). 2008 [1997]. *Nationalism and ethnicity in Nepal.* Reprinted, 3-31. Kathmandu, Nepal: Vajra Publications.

Gellner, David N. (eds.). 2008b. *Resistance and the state. Nepalese experiences.* New Delhi, India: Social Science Press.

Gellner, David N.; Joanna Pfaff-Czarnecka and John Whelpton (eds.). 2008 [1997]. *Nationalism and ethnicity in Nepal.* Reprinted. Kathmandu, Nepal: Vajra Publications.

Gennep, Arnold van. 1908. *The rites of passage.* New edition. London, UK: Routledge and Kegan Paul, 1960.

Ghare, A.D.; P.J. Wadhai; N.J. Mistry and P.D. Porey. 2008. Hydraulic and environmental aspects of long crested weirs. *Global Journal of Environmental Research*, 2 (3): 122-125.

Ghimire, Sujan. 2004. Women and irrigation in Nepal: Context, issues and prospects. *Water Nepal*, 11 (2): 3-31.

Giddens, Anthony. 1984. *The constitution of society. Outline of the theory of structuration*. Cambridge, UK: Polity Press.

Gilmartin, David. 1994. Scientific empire and imperial science: Colonialism and irrigation technology in the Indus Basin. *The Journal of Asian Studies*, 53 (4): 1127-1149.

Gilmartin, David. 2003. Water and waste: Nature, productivity and colonialism in the Indus basin. *Economic and Political Weekly*, 29: 1-29.

Gilmore, David D. 1990. *Manhood in the making. Cultural concepts of masculinity.* New York, US: Vail-Ballou Press.

GOI. 1946. *Kosi dam project: Preliminary report.* New Delhi, India: Government of India (GOI), Central Waterways, Irrigation and Navigation Commission.

GON. 1956. *Five-year development plan (1956-1961)*. Kathmandu, Nepal: Government of Nepal (GON).

GON. 2002. *Minutes of first meeting of the Nepal-India Joint Committee on Water Resources,* 1-3 October 2000. Kathmandu, Nepal: Government of Nepal (GON).

GON. 2002. *National Water Resources Strategy*. Kathmandu, Nepal: Government of Nepal (GON), Water and Energy Commission Secretariat.

GON/SNV. 1992. *Mechi Hill Development Programme, Phase II. Project Document. Version 6.* Kathmandu, Nepal: Government of Nepal (GON) and Stichting Nederlandse Vrijwilligers (SNV).

Goffman, Erving. 1959. *The presentation of the self in everyday life*. New York, US: Garden City.

Guneratne, Arjun. 1994. *The Tharus of Chitwan: Ethnicity, class and the state in Nepal.* PhD Thesis. University of Chicago, US.

Guneratne, Arjun. 1999. The modernizing matwalis: Caste, class and status among the Tharus of Chitwan. In: Harald O. Skar (eds.). *Nepal: Tharu and Tarai neighbours*, chapter 8: 159-173. Kathmandu, Nepal: EMR Kathmandu.

Guneratne, Arjun. 2002. *Many tongues, one people. The making of Tharu identity in Nepal*. Ithaca, US: Cornell University Press.

Gupta, Namrata. 2007. Indian women in doctoral education in science and engineering. A study of informal milieu at the reputed Indian Institutes of Technology. *Science, Technology and Human Values*, 32 (5): 507-533.

Gurung, Harka. 1972. *Graduates in Nepal. A diagnostic study.* Kathmandu, Nepal: National Planning Commission.

Guthman, Julie. 1997. Representing crisis: The theory of Himalayan environment degradation and the project of development in Post-Rana Nepal. *Development and Change*, 28: 45-69.

Gyawali, Dipak. 2001. *Water in Nepal*. Kathmandu, Nepal: Himal Books.

Gyawali, Dipak. 2009. Epilogue (Re-imaging Nepal's water: Institutional blind spots, developmental blind alleys and the lessons of the past century). In: Dwarika N. Dhungel and Santa B. Pun (eds.). *The Nepal-India water relationship: Challenges*, chapter 11: 295-318. Kathmandu, Nepal: Institute for Integrated Development Studies and Dordrecht, the Netherlands: Springer.

Gyawali, Dipak. 2013. Reflecting on the chasm between water punditry and water politics. *Water Alternatives*, 6 (2): 177-194.

Hagen, Toni. 1969. *Report on the geological survey of Nepal*. Volume 1: Preliminary reconnaissance, attached plates. Zürich, Switzerland: Art. Institut Orell Füssli AG.

Ham, Willem van der. 2003. *Meester van de zee. Johan van Veen, waterstaatsingenieur 1893-1959*. [Master of the sea. Johan van Veen, state water engineer 1893-1959]. Amsterdam, the Netherlands: Uitgeverij Balans.

Ham, Willem van der. 2007. *Verover mij dat land. Lely en de Zuiderzeewerken*. [Conquer for me that land. Lely and the civil works of the South Sea]. Amsterdam, the Netherlands: Boom.

Hamilton, Coradel. 1965. The role of the FAO in the international home economics effort. In: CARD (eds.). *International home economics*, 187-208. CARD Reports. Book 27. Ames, US: Iowa State University, Centre for Agricultural and Economic Development (CARD).

Haney, W.; and J. Knowles. 1988. Introduction: Making "the invisible farmer" visible. In: W. Haney and J. Knowles (eds.). *Women and farming. Changing roles, changing structures*, 1-12. Boulder, US and London, UK: Westview Press.

Haraway, Donna. 1991. *Simians, cyborgs and women. The reinvention of nature*. London, UK: Free Association Books.

Harding, Sandra. 1986. *The science question in feminism.* Ithaca, US and London, UK: Cornell University Press.

Harding, Sandra. 1991. *Whose science? Whose knowledge?* Ithaca, US: Cornell University Press.

Herr, Kathryn; and Gary L. Anderson. 2005. *The action research dissertation. A guide for students and faculty.* Thousand Oaks, US; London, UK and New Delhi, India: Sage Publications.

Hilgartner, Stephen. 2000. *Science on stage. Expert advice as public drama.* Stanford, California, US: Stanford University Press.

Himalayan. 2009. Charged-up minister bats for energy. *The Himalayan*, 14 June 2009: 4.

HMG-N. 1966. *Proceedings of the agricultural conference II, 1964*. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N).

HMG-N. 1970a. *Fourth five-year plan for Nepal (1970-1975).* Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N).

HMG-N. 1970b. *Master plan for irrigation development in Nepal.* Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N), Ministry of Water Resources.

HMG-N. 1985. *Sixth five-year development plan (1985-1990).* Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N).

HMG-N. 1988. *Report of the sector coordination meeting on irrigation*, Kathmandu, Nepal, 22 February 1988. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N).

HMG-N/ADB. 1972. *Technical assistant agreement (Chitwan Valley Development Project).* Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Asian Development Bank (ADB).

HMG-N/ADC. 1983. *Water management in Nepal*. Proceedings of a seminar on water management issues, Kathmandu, Nepal, 31 July to 2 August 1983. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Agricultural Development Council (ADC).

HMG-N/FAO. 1976. *Water management and control at farm level*. Proceedings of a national seminar, Kathmandu, Nepal, 8 to 13 March 1976. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Food and Agricultural Organization (FAO).

HMG-N/SNV. 1987. *Implementation plan Mechi Hill Irrigation and Related Development Programme (Mechi-programme).* Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Stichting Nederlandse Vrijwilligers (SNV).

HMG-N/USAID. 1986. *Rapid appraisal of Nepal irrigation systems*. Water Management Synthesis Project, WMS Report 43. Irrigation Management Project. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and United States Agency for International Development (USAID).

HMG-N/Winrock. 1980. *Job environment and job consciousness of agricultural graduates*. Research paper series 7. Strengthening institutional capacity in the food and agricultural sector in Nepal. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Winrock International (Winrock).

Höfer, András. 2004 [1979]. *The caste hierarchy and the state in Nepal. A study of the Muluki Ain of 1854.* Second edition. Kathmandu, Nepal: Himal Books.

Hollywood, Amy. 2004. Gender, agency and the divine in religious historiography. *The Journal of Religion*, 84 (4): 514-528.

Howard-Grenville, J.; K. Golden-Biddle, J. Irwin, and J. Mao. 2011. Liminality as cultural process for cultural change. *Organization Science*, 22 (2): 522–539.

Howarth, S.E.; and N.K. Lal. 2002. Irrigation and participation: Rehabilitation of the Rajapur project in Nepal. *Irrigation and Drainage Systems*, 16: 111-138.

IAAS. 2007. *Fifty years at the Institute of Agriculture and Animal Science*. Rampur, Nepal: Institute of Agriculture and Animal Science (IAAS).

IAM. 1964. *Brief statistics of Indian aid to Nepal*. Kathmandu, Nepal: Indian Aid Mission (IAM).

ICID/FAO. 1996. *Irrigation scheduling: From theory to practice. Proceedings.* Proceedings of the 'ICID/FAO Workshop on Irrigation Scheduling', Rome, Italy, 12-13 September 1995. New Delhi, India: International Commission on Irrigation and Drainage (ICID) and Rome, Italy: Food and Agriculture Organization (FAO).

IIMI. 1986. *Annual report 1986.* Colombo, Sri Lanka: International Irrigation Management Institute (IIMI).

IIMI/IAAS/Winrock. 1988. *Irrigation management in Nepal: Research papers from a national seminar*, Bharatpur, Nepal, 4-6 June 1987. Colombo, Sri Lanka: International Irrigation Management Institute (IIMI); Rampur, Nepal: Institute of Agriculture and Animal Science (IAAS) and Kathmandu, Nepal: Winrock International.

IIMI/WECS. 1987. *Public intervention in farmer-managed irrigation systems.* Colombo, Sri Lanka: International Irrigation Management Institute (IIMI) and Kathmandu, Nepal: Water Energy Commission Secretariat (WECS).

IOE. 2005. *Profile.* Institute of Engineering. Kathmandu, Nepal: Institute of Engineering (IOE).

IWMI. 2004. *Strategies for the management of conjunctive use of surface water and groundwater resources in semi-arid areas: A case study from Pakistan.* Research Report 86. Colombo, Sri Lanka: International Water Management Institute (IWMI).

Iyer, Ramaswamy R. 2013. The story of a troubled relationship. *Water Alternatives,* 6 (2): 168-176.

Janiewski, D. 1988. Making women into farmers' wives: The native American experience in the inland Northwest. In: W. Haney and J. Knowles (eds.). *Women and farming. Changing roles, changing structures,* 35-54. Boulder, US and London, UK: Westview Press.

Jensen, J. 1986. Crossing ethnic barriers in the Southwest: Women's agricultural extension education, 1914-1940, *Agricultural History*, 60: 169-181.

John, Graham St. (eds.). 2008. *Victor Turner and contemporary cultural performance*. New York, US: Bergahn Books.

Jyoti. 1985. *Report on the breakage of impellers at Chitwan Irrigation Project*. Bombay, India: Jyoti Limited (Jyoti).

Kafle, Mukunda Prasad. 1995. *The role of NGOs in women development (a case study of Chitwan District).* MA Dissertation. Tribhuvan University, Nepal.

Kakar, Sudhir. 1981. *The inner world: A psychoanalytic study of childhood and society in India.* Delhi, India: Oxford University Press.

Kanter, R.M. 1977. *Men and women of the corporation.* New York, US: Basic Books.

Karmacharya, Sumita; Nalini Lamichhane, Ameena Shrestha and Neeraj Narayan Joshi. 2003. *Demand and supply of women professionals in the NRM sector in Nepal*. Research report, series no. 48. Policy Analysis in Agriculture and Related Resource Management. Kathmandu, Nepal: Winrock International.

Keith, S.C. 1985. The politicization of bureaucracies in developing countries: St. Kitts-Nevis: A case study. *Phylon*, 46 (1): 58-70.

Khanal, Ashish Bhadra. 2010. Retrospective of the irrigation related policies in Nepal: Post-1990 era. In: DOI. *Challenges in irrigation development and management*, 56-66. Proceedings report of the National Irrigation Seminar, Kathmandu, Nepal, 11-12 July 2010. Kathmandu, Nepal: Department of Irrigation (DOI).

Khanal, Puspa Raj. 1997. Analysis of process and impacts of management transfer in Khageri and Panchakanya Irrigation Project: The lessons learned. In: I. Neupane and K.C. Prasad (eds.). *Evaluation of irrigation management transfer: Process and performance*, 48-61. Workshop proceedings, Kathmandu, Nepal, 5-6 October 1997. Kathmandu, Nepal: Department of Irrigation and Colombo, Sri Lanka: International Irrigation Management Institute.

Khanal, Puspa Raj. 2003. *Engineering participation. The process and outcomes of irrigation management transfer in the Terai of Nepal.* Wageningen University Water Resources Series. New Delhi, India: Orient Longman.

Khatri-Chhetri, T.B.; N.K. Mishra; S.N. Tiwari; G.P. Shivakoti and A. Shukla. 1988. Lessons from inventory preparation of irrigation systems of Budhi Rapti river, Chitwan, Nepal. In: IIMI/IAAS/Winrock. *Irrigation management in Nepal: Research papers from a national seminar*, Bharatpur, Nepal, 4-6 June 1987. Colombo, Sri Lanka: International Irrigation Management Institute (IIMI); Rampur, Nepal: Institute of Agriculture and Animal Science (IAAS) and Kathmandu, Nepal: Winrock International (Winrock).

Kimmel, Michael S (eds.). 1987. *Changing men. New directions in research on men and masculinity.* Newbury Park, US; London, UK and New Delhi, India: Sage Publications.

Kleif, Tine; and Wendy Faulkner. 2003. “I’am not athlete [but] I can make this thing dance!” Men’s pleasure in technology. *Science, Technology and Human Values*, 28 (2): 296-325.

Klein, Julie Thompson. 1990. *Interdisciplinarity: History, theory, and practice.* Detroit, US: Wayne State University Press.

Klein, Julie Thompson. 2004. Interdisciplinarity and complexity: An Evolving relationship. *E:CO*, 6 (1-2): 2-10.

Klein, Julie Thompson; and W. Newell. 1997. Advancing interdisciplinary Studies. In: J. Gaff and J. Ratcliff (eds.). *Handbook of the undergraduate curriculum: A comprehensive guide to purposes, structures, practices, and changes*, 393-415. San Francisco, US: Jossey-Bass.

Klingensmith, Daniel. 2007. *‘One valley and a thousand’. Dams, nationalism and development.* New Delhi, India: Oxford University Press.

Knowles, J. 1985. Science and farm women's work: The agrarian origins of home economic extension. *Agriculture and Human Values*, 2 (1): 52 -55.

Koirala, D. 1967. Minor irrigation in Nepal. Viewpoint. *The Rising Nepal*, 5 January 1967: 3.

Kopila, Rani Mohan. 1993. *Emergence of political leadership in Nepal: A study of Chitawan district (1960-1990).* PhD Thesis. Banaras Hindu University, India.

Koppen, Barbara van; Jacobijn van Etten; Prabina Bajracharya and Amita Tuladhar. 2001. *Women irrigators and leaders in the West Gandak scheme, Nepal.* Working paper 15. Colombo, Sri Lanka: International Water Management Institute.

Korten, Frances F.; and Robert Y. Siy. 1989. *Transforming a bureaucracy: The experience of the Philippines National Irrigation Administration.* Bloomfield, US: Kumarian Press.

Kramer, V.W.; A.M. Konrad and S. Erkut. 2006. *Critical mass on corporate boards: Why three or more women enhance governance.* Wellesley Centers for Women, Report No. WCW 11. Wellesley, US: Wellesley Centers for Women.

Krauskopff, Gisèle. 2000. From jungle to farms: A look at Tharu history. In: Gisèle Krauskopff and Pamela Deuel Meyer (eds.). 2000. *The kings of Nepal and the Taru of the Tarai. The Panjiar collection: Fifty royal documents 1726 to 1971*, 25-48. Kathmandu, Nepal: Centre for Nepal and Asian Studies and Los Angeles, US: Rusca Press.

Krauskopff, Gisèle; and Pamela Deuel Meyer (eds.). 2000. *The kings of Nepal and the Taru of the Tarai. The Panjiar collection: Fifty royal documents 1726 to 1971.* Kathmandu, Nepal: Centre for Nepal and Asian Studies and Los Angeles, US: Rusca Press.

Latour, Bruno. 2000. When things strike back – a possible contribution to science studies. *British Journal of Sociology*, 51 (1): 105-123.

Latour, Bruno; and S. Woolgar. 1986. *Laboratory life: The construction of scientific facts.* Second edition. Princeton, US: Princeton University Press.

Laurie, Nina. 2005. Developing development orthodoxy: Negotiating masculinities in the water sector. *Development and Change*, 36 (3): 527-549.

Lave, Jean. 1993. The practice of learning. In: Seth Chaiklin and Jean Lave (eds.). *Understanding practice: Perspectives on activity and context*, chapter 1: 3-32. Cambridge, UK: Cambridge University Press.

Lave, Jean, and Etienne Wenger. 1991. *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Law, John. 2009. Seeing like a survey. *Cultural Sociology*, 3 (2): 239-256.

Law, John; and Vicky Singleton. 2000. Performing technology's stories: On social constructivism, performance and performativity. *Technology and Culture*, 41 (4): 765-775.

Lebbink, Sven; Chantal Steuten and Marjel Neefjes. 2013. *Kansen voor vrouwelijk talent. Over carrières en barrières van vrouwen bij Wageningen UR.* [Opportunities for female talent. About careers and barriers of women at Wageningen UR]. Wetenschapswinkel. Report 292. Wageningen, the Netherlands: Wageningen University.

Levine, Gilbert. 1977. Management components in irrigation system design and operation. *Agricultural Administration*, 4: 37-48.

Levine, Gilbert. 1983. The Asian context for irrigation. In: HMG-N/ADC. *Water management in Nepal*, 47-60. Proceedings of the seminar on water management issue, Kathmandu, Nepal, 31 July to 2 August 1983. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Agricultural Development Council (ADC).

Levine, Gilbert. 1992. The irrigation programme at Cornell University. In: Geert Diemer and Jacques Slabbers (eds.). *Irrigators and engineers. Essays in honour of Lycas Horst*, 25-31. Amsterdam, the Netherlands: Thesis Publishers.

Levine, Gilbert. 2013. The search for understanding irrigation – fifty years of learning. *Water Alternatives*, 6 (2): 259-264.

Liebrand, Janwillem. 2003. *Internship report.* Wageningen University, the Netherlands.

Liebrand, Janwillem. 2010. Masculinities: A scale challenge in irrigation governance in Nepal. In: Prachanda Pradhan; Upendra Gautam and Naveen Mangal Joshi (eds.). *Dynamics of Farmer Managed Irrigation Systems: Socio-institutional, economic and technical context,* 53-72. Proceedings of the fifth international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 25-26 March 2010. Nepal, Kathmandu: Farmer Managed Irrigation System Promotion Trust.

Liebrand, Janwillem; and Manpriet Singh. 2012. Panchakanya Irrigation System. In: INPIM/N. *Case studies of water users' associations in Nepal.* Kathmandu, Nepal: International Network of Participatory Irrigation Management, Nepal (INPIM/N).

Liebrand, Janwillem; and Saroj Yakami. 2011. The success of the WUA of Pauwa Sartapp irrigation system: Strong leadership and external funds. In: Tribhuvan Paudel, Suman Sijapati and Richiram Sharma Neupane (eds.). *Participatory irrigation and examples of practices of water users' associations in Nepal*, 53-56. Kathmandu, Nepal: International Network of Participatory Irrigation Management, Nepal.

Lilienthal, David. 1953. *TVA: Democracy on the march.* New York, US: Harper and Brothers Publishers.

Long, Norman. 1984. Creating space for change: A perspective on the sociology of development. Inaugural lecture, Wageningen Agricultural University. A revised version in *Sociologia Ruralis*, XXIV, 3-4: 168-184.

Long, Norman (eds.). 1989. *Encounters at the interface: A perspective on structural discontinuity in rural development.* Wageningen Studies in Sociology 27. Wageningen, the Netherlands: Wageningen Agricultural University.

Long, Norman. 2001. *Development sociology: Actor perspectives.* Oxon, UK and New York, US: Routledge.

Ludvig, Alice. 2006. Difference between women? Intersecting voices in a female narrative. *European Journal of Women's Studies*, 13 (3): 245-258.

Lund, C. 2006. Twilight institutions: Public authority and local politics in Africa. *Development and Change*, 37 (4): 685-705.

Lykke, Nina. 2004. Women's/ Gender/ Feminist Studies – a post disciplinary discipline? In: Rosi Braidotti (eds.). *The Making of European Women's Studies*, Volume V: 90-102. Utrecht, the Netherlands: Athena.

Lynch, Barbara D. 1993. *The bureaucratic tradition and women's invisibility in irrigation*. Proceedings of the Chacmool conference, 333-342. Alberta, Canada: University of Calgary and Archaeological Association.

Mahmood, Saba. 2001. Feminist theory, embodiment and the docile agent: Some reflections on the Egyptian Islamic Revival. *Cultural Anthropology*, 6 (2): 202-236.

Makwarimba, E.; and L.F. Vincent. 2004. Job satisfaction and the organisational lifeworlds of extension workers in irrigation in Manicaland. In: Henk A.J. Moll, Cees Leeuwis, Emmanuel Manzungu and Linden F. Vincent (eds.). *Agrarian institutions between policies and local action. Experiences from Zimbabwe*, chapter 11: 241-280. Harare, Zimbabwe: Weaver Press.

Mallioux, Laurie. 1981. *Thirty years of American assistance to Nepal.* Kathmandu, Nepal: United States Agency for International Development.

Markussen, Turid. 2005. Practising performativity. Transformative moments in research. *European Journal of Women's Studies*, 12 (3): 329-334.

Martin, Edward, 1986. *Resource mobilization, water allocation and farmer organization in hill irrigation systems in Nepal.* PhD Thesis. Cornell University, US.

Martin, Edward; and Robert Yoder. 1983. Review of farmer-managed irrigation in Nepal. In: HMG-N/ADC. *Water management in Nepal*, 82-91. Proceedings of the seminar on water management issue, Kathmandu, Nepal, 31 July to 2 August 1983. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N) and Agricultural Development Council (ADC).

Martin, Edward; and Robert Yoder. 1988. A comparative description of two farmer-managed irrigation systems in Nepal. *Irrigation and Drainage Systems*, 2: 147-172.

Martin, Patricia Yancey. 2001. 'Mobilizing masculinities': Women's experiences of men at work. *Organization*, 8 (4): 587-618

Maskey, J.P. 1978. *Foreign aid to Nepal: A comparative study of American and Indian Aid to Nepal*. MA thesis. Tribhuvan University, Nepal.

Mathema, Kanhaiya Ram Bhakta. 1999. *A comparative study of sponsored and spontaneous settlers in Nepal: A case of Chitwan and Nawalparasi Districts*. PhD Thesis. Tribhuvan University, Nepal.

McCall, Leslie. 2005. The complexity of intersectionality. *Signs: Journal of Women in Culture and Society*, 30 (31): 1771-1800.

McDonaugh, Christian E.J. 1984. *The Tharus of Dang: A study of social organization, myth and ritual in West Nepal*. PhD Thesis. Oxford University, UK.

McDonaugh, Christian E.J. 1989. The mythology of the Tharu: Aspects of cultural identity in Dang, West Nepal. *Kailash*, 15 (3-4): 191-206.

McDonaugh, Christian E.J. 1997. Losing ground, gaining ground: Land and change in a Tharu community in Dang, West Nepal. In: David N. Gellner, Joanna Pfaff-Czarnecka and John Whelpton (eds.). *Nationalism and ethnicity in a Hindu kingdom: The politics of culture in contemporary Nepal*, 275-298. Amsterdam, the Netherlands: Harwood.

Mcilwaine C.; and K. Datta. 2003. From feminising to engendering development. *Gender, Place and Culture*, 10 (4): 369-382.

McKenzie, Jon. 2001. *Perform or else: From discipline to performance.* London, UK and New York, US: Routledge.

McLean, Joanne. 1999. Conservation and the impact of relocation on the Tharus of Chitwan, Nepal. *Himalayan Research Bulletin*, XIX (2): 38-44.

Merrey, Douglas. 2009. Will future water professionals sink under received wisdom, or swim to a new paradigm? *Irrigation and Drainage*, 58 (S2): S168-S176.

Merrey, Douglas; and Shirish Baviskar (eds.). 1998. *Gender analysis and reform of irrigation management: Concepts, cases and gaps in knowledge.* Proceedings of the workshop on gender and water, Habarana, Sri Lanka, 15-19 September 1997. Colombo, Sri Lanka: International Water Management Institute.

Merton, R.K. 1996. *Social structure of science.* Chicago, US: University of Chicago Press.

MFAI. 1975. *FAO activities in Nepal in the field of Agriculture Sector during 1953-1975*. Kathmandu, Nepal: Ministry of Food, Agriculture and Irrigation (MFAI).

Michaels, Axel. 2008 [1997]. The king and the cow: On a crucial symbol of Hinduization in Nepal. In: David N. Gellner; Joanna Pfaff-Czarnecka and John Whelpton (eds.). *Nationalism and ethnicity in Nepal*, 79-99. Reprinted. Kathmandu, Nepal: Vajra Publications.

Mihaly, Eugene Bramer. 2002 [1965]. *Foreign aid and politics in Nepal: A case study.* Reprinted. Kathmandu, Nepal: Himal books.

Mital, K.V. 1986. *History of Thomason College of Engineering, 1847-1949, on which is founded the University of Roorkee*. Roorkee, India: University of Roorkee.

MOA. 1994. *Women in resettlement area (A case study of Nawalparasi District).* Kathmandu, Nepal: Ministry of Agriculture (MOA), Women Farmer Development Division.

MOFA, 1998. *SNV-Nepal, 1985-1995. Evaluation report 1998.* The Hague, the Netherlands: Ministry of Foreign Affairs (MOFA), Government of the Netherlands.

Mohanty, Manoranjan (eds.). 2004. *Class, caste and gender.* Readings in Indian government and politics, 5. New Delhi, India; Thousand Oaks, US and London, UK: Sage publications.

Molle, Francois. 2009. Water and society: New problems faced, new skills needed. *Irrigation and Drainage*, 58 (S2): S205-S211.

Molle, Francois; Peter P. Mollinga and Philippus Wester. 2009. Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power. *Water Alternatives*, 2 (3): 328-349.

Molle, Francois; Peter P. Mollinga and Ruth Meinzen-Dick. 2008. Water, politics and development: Introducing water alternatives. *Water Alternatives*, 1 (1): 1-6

Mollinga, Peter. 2003. *On the waterfront. Water distribution, technology and agrarian change in a South Indian canal irrigation system.* Wageningen University Water Resources Series. New Delhi, India: Orient Longman.

Mollinga, Peter. 2009. Towards the transdisciplinary engineer: Incorporating ecology, equity and democracy concerns into water professionals' attitudes, skills and knowledge. *Irrigation and Drainage*, 58 (S2): S195-S204.

Moser, Caroline. 1989. Gender planning in the Third World: Meeting practical and strategic gender needs. *World Development*, 17 (11): 1799-1825.

Mosse, David. 2004. Is good policy unimplementable? Reflections on the ethnography of aid policy and practice. *Development and Change*, 35 (4): 639-671.

Mosse, David. 2005. *Cultivating development. An ethnography of aid policy and practice*. London, UK: Pluto Press.

MOWR. 1981. *Water the key to Nepal's development. A brief account of the country's water resources development (second edition).* Kathmandu, Nepal: Ministry of Water Resources (MOWR).

MOWR. 1985. *Water resources development in Nepal.* Kathmandu, Nepal: Ministry of Water Resources (MOWR).

Mukherji, Aditi; Blanka Füleki; Tushaar Shah; Diana Suhardiman; Mark Giordano and Parakrama Weligamage. 2009a. *Irrigation reform in Asia: A review of 108 cases of irrigation management transfer.* Sri Lanka, Colombo: International Water Management Institute.

Mukherji, Aditi; Thierry Facon; Jacob Burke; Charlotte de Fraiture; Jean-Marc Faurès; Blanka Füleki; Mark Giordano; David Molden; Tushaar Shah. 2009b. *Revitalizing Asia's irrigation: To sustainably meet tomorrow's food needs.* Colombo, Sri Lanka: International Water Management Institute and Rome, Italy: Food and Agriculture Organisation.

Müller-Böker, Ulrike. 1993. Tharus and Pahariyas in Citawan: Some observations concerning the question of multiethnicity in Nepal. In: G. Toffin (eds.). *Nepal, past and present*. Proceedings of Franco-German Conference Arc-et-Senans, June 1990. Paris, France: Centre National de la Recherche Scientifique.

Müller-Böker, Ulrike. 1999. *The Chitawan Tharus in Southern Nepal: An ethnoecological approach*. Stuttgart, Germany: Franz Steiner Verlag Stuttgart.

Munro, Rolland. 1999. The cultural performance of control. *Organization Studies,* 20: 619-640.

Murari, Krishna. 1966. Role of irrigation and drainage in development of agriculture. In: HMG-N. *Proceedings of the agricultural conference II 1964, Part II*: 55-60. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N).

Nair, Sreelekha. 2012. *Women in Indian engineering. A preliminary analysis of data from the graduate level engineering education field in Kerala and Rajasthan.* Occasional paper no. 58. New Delhi, India: Centre for Women's Development Studies.

NEC. 2008. *Master in interdisciplinary water resources management. Program 2008*. Bhaktapur, Nepal: Nepal Engineering College (*NEC*).

NEC. 2009. *Profile of women water professionals in Nepal.* Professional Women for Promotional Activity (PWPA), Nepal. Bhaktapur, Nepal: Nepal Engineering College (*NEC*).

Nepal, R. P. 1967. Water resources investigations in Nepal. *The Rising Nepal*, 10 April 1967: 10.

Nepal, Sanjay K.; and Karl E. Weber. 1995. The quandary of local people-park relations in Nepal's Royal Chitwan National Park. *Environmental Management*, 19 (6): 853-866.

Neupane, I.; and K.C. Prasad. 1997. *Evaluation of irrigation management transfer: Process and performance.* Workshop proceedings, Kathmandu, Nepal, 5-6 October 1997. Kathmandu, Nepal: Department of Irrigation and Colombo, Sri Lanka: International Irrigation Management Institute.

NPC. 1995. *Nepal agricultural perspective plan (final report). Main document*. Kathmandu, Nepal: National Planning Commission (NPC).

Nuijten, M.; G. Anders, J. van Gastel, G. van Haar, C. van Nijnatten and Jeroen Warner. 2004. Governance in action: Theoretical and methodological discussions around a key concept. In: D. Kalb, W. Pansters, H. Siebers (eds.). *Globalization and development: Themes and concepts in current research*, 103-130. Dordrecht, the Netherlands: Kluwer Academic Publishers.

NWP/JVS. 2006. *Highlights 2002-2006.* Kathmandu, Nepal: Nepal Water Partnership/Jalsrot Vikas Sanstha (NWP/JVS).

Oakman, Daniel. 2000. The seed of freedom: Regional security and the Colombo Plan. *Australian Journal of Politics and History*, 46 (1): 67-85.

Ohja, D.P. 1983. History of land settlement in Nepal Tarai. *Contributions to Nepalese Studies*, 11 (1): 21-44.

Oldenziel, Ruth. 1999. *Making technology masculine. Men, women and modern machines in America, 1870-1945.* Amsterdam, the Netherlands: Amsterdam University Press.

Ongsakul, Rutmanee; Bernadette Resurreccion and Edsel Sajor. 2012. Normalizing masculinities in water bureaucracy in Thailand. *International Journal of Public Administration*, 35 (9): 577-586.

Onta, P. 1996. Ambivalence denied: The making of Rastriya Ithihas in Panchayat era textbooks. *Contributions to Nepalese Studies*, 23: 213-254.

Ostrom, Elinor. 1992. *Crafting institutions for self-governing irrigation systems.* New York and San Francisco, US: Institute for Contemporary Studies.

Packard, Randall M. 1997. Malaria dreams: Postwar visions of health and development in the third world. *Medical Anthropology*, 17 (3): 279-296.

Paechter, Carrie. 2003a. Masculinities and femininities as communities of practice. *Women's Studies International Forum*, 26 (1): 69-77.

Paechter, Carrie. 2003b. Learning masculinities and femininities: Power/knowledge and legitimate peripheral participation. *Women's Studies International Forum*, 26 (6): 541-552.

Paechter, Carrie. 2006. Power, knowledge and embodiment in communities of sex/gender practice. *Women's Studies International Forum*, 29: 13-26

Panday, Devendra Raj. 2009 [1999]. *Nepal's failed development. Reflections on the mission and maladies.* Tenth anniversary edition. Kathmandu, Nepal: Nepal South Asia Centre.

Pandey, Bhim Bahadur. 1988. *Tyas Bakhatko Nepal.* [Nepal at that time]. Volume 1 to 4. Kathmandu, Nepal: Self-published.

Pant, Druba Raj. 2000. *Intervention processes and irrigation institutions. Sustainability of farmer managed irrigation systems in Nepal.* PhD Thesis. Wageningen University, the Netherlands.

Parikh, P.P.; R. Bindu and S.P. Sukhatme. 2003. Job status and career profile of women engineers in India. *International Journal of Engineering Education*, 19 (4): 631-638.

Parikh, P.P.; and S.P. Sukhatme. 1994. Women engineers in India: Present scenario and current trends. *Journal of Scientific and Industrial Research*, 53: 233-247.

Parikh, P.P. and S.P. Sukhatme. 2004. Women engineers in India. *Economic and Political Weekly*, January 10, 2004: 193-201.

Phoenix, Ann; and Pamela Pattynama. 2006. Editorial. Intersectionality. *European Journal of Women's Studies*, 13 (3): 187-192.

Potschky, Susie. 2008. Seductive landscapes: Gender, race and European representations of nature in the Dutch East Indies during the late colonial period. *Gender and History*, 20 (2): 372-398.

Poudel, R.; Ashutosh Shukla, N.R. Joshi, S.M. Shakya and D.N. Yadav. 1996. *Understanding the dynamics of rehabilitation process: The lessons from intervention program under East Rapti Irrigation Project Intervention.* Paper prepared for the conference on 'Participation, People and Sustainable Development: Understanding the Dynamics of Natural Resource System', Rampur, Institute of Agriculture and Animal Science, March 17-20, 1996. Rampur, Nepal: Institute of Agriculture and Animal Science.

Poudel, Som Nath. 1986. *Irrigation development in Nepal.* Kathmandu, Nepal: Kamala Poudel.

Poudel, Som Nath. 2009. Water resources utilization: Irrigation. In: Dwarika N. Dhungel and Santa B. Pun (eds.). *The Nepal-India Water Relationship: Challenges*, chapter 4: 99-123. Kathmandu, Nepal: Institute for Integrated Development Studies and Dordrecht, the Netherlands: Springer.

Poudyal, S.R. 2009. *Dynamics of formal and informal institutions shaping the administrative culture.* Master Thesis. Institute of Social Studies, the Netherlands.

Pradhan, B.B. 1982. *Participatory irrigation management: Medium irrigation project.* Kathmandu, Nepal: World Bank and Sir MacDonald Partners Limited.

Pradhan, Bubanesh Kumar. 1974. *Project analysis of the Narayani Zone Irrigation Development Project, Birgunj, Nepal.* Prepared for seminar on agriculture planning and project analysis, Kathmandu, Nepal, 17 November to 6 December 1974. Kathmandu, Nepal: Department of Irrigation, Hydrology and Meteorology.

Pradhan, Bubanesh Kumar. 2009. Personal reflections: Nepal-India water relations. In: Dwarika N. Dungel and Santa B. Pun (eds.). *The Nepal-India Water Relationship: Challenges*, chapter 9: 243-267. Kathmandu, Nepal: Institute for Integrated Development Studies and Dordrecht, the Netherlands: Springer.

Pradhan, Prachanda (eds.). 1971. *Aspects of development administration.* Occasional paper 2. Kirtipur, Nepal: Tribhuvan University, Centre for Economic Development and Administration.

Pradhan, Prachanda. 1980. *Local institutions and people's participation in rural public works in Nepal.* Ithaca, US: Cornell University, Rural Development Committee, Centre for International Studies.

Pradhan, Prachanda. 1984. *Chhatis Mauja Irrigation System: Community response in resource management.* Paper for a seminar, Bangalore, India, 4-7 January 1984. Bangalore, India: Indian Institute of Management, Social Science Research Council.

Pradhan, Prachanda. 1989. *A comparative study of 21 farmer-managed irrigation systems*. Colombo, Sri Lanka: International Irrigation Management Institute.

Pradhan, Prachanda. 2007. Twenty five years of FMIS study in Nepal. In: Prachanda Pradhan, Laya Prasad Uprety, Umesh Nath Parajuli and Uprendra Gautam (eds.). *Irrigation in transition: Interacting with internal and external factors and setting the strategic action*, 360-365. Proceedings of the fourth international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 6-7 November 2007. Kathmandu, Nepal: Farmer Managed Irrigation Systems Promotion Trust.

Pradhan, Prachanda; and Robert Yoder. 1990. Irrigation development: The management and use of irrigation in the mountains of Nepal. Kathmandu, Nepal: International Centre for Integrated Mountain Development.

Pradhan, Prachanda; Uprendra Gautam and Naveen Mangal Joshi (eds.). 2010. *Dynamics of farmer managed irrigation systems: Socio-institutional, economic and technical contexts.* Proceedings of the fifth international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 25-26 March 2010. Kathmandu, Nepal: Farmer Managed Irrigation Systems Promotion Trust.

Pradhan, P.S. 1966. Rapti tractor station. In: HMG-N. 1966. *Proceedings of the agricultural conference II 1964, Part II*: 157-159. Kathmandu, Nepal: His Majesty's Government of Nepal (HMG-N).

Pradhan, Rajendra; Franz von Benda-Beckmann, Keebet von Benda-Beckmann, H.L.J. Spiertz, Shantam S. Khadka and K. Azharul Haq (eds.). 1997. *Water rights, conflicts and policy.* Proceedings of a workshop, Kathmandu, Nepal, 22-24 January 1996. Colombo, Sri Lanka: International Irrigation Management Institute.

Pradhan, Uijwal. 1990. *Property rights and state intervention in hill irrigation systems in Nepal.* PhD Thesis. Cornell University, US.

Pradhan, Ujjwal; Alfredo Valera and Sujata Rana. 1992. *Proceedings of the national workshop on the role of NGOs in irrigation development and management.* Sri Lanka, Colombo: International Irrigation Management Institute and Kathmandu, Nepal: Udaya-Himalaya Network.

Prasad, Ramashray. 2009. Flood estimation of Kosi River. In: A. Kumar, R.S. Kushwaha, and B. Thakur (eds.). *Earth system sciences: Felicitation volumes in honour of professor V.K. Verma*, chapter 34: 510-538. New Delhi, India: Ashok Kumar Mittal.

Pryse, Marjorie. 1998. Critical interdisciplinarity, women's Studies, and cross-cultural insights. *NWSA Journal*, 10 (1): 1-22.

Pryse, Majorie. 2000. Trans/feminist methodology: Bridges to interdisciplinary thinking. *NWSA Journal*, 12 (2): 105-118.

Rademacher, Anne. 2007. Farewell to the Bagmati civilisation: Losing riverscape and nation in Kathmandu. *National Identities*, 9 (2): 127-142.

Rana, Jitendra. 1993. Resource mobilization and water distribution in a large farmer-managed irrigation system: A case study of the Chhattis Mauja Irrigation System in Nepal. In: Manor, Shaul; and Jorge Chambouleyron (eds.). 1993. *Performance measurement in Farmer-Managed Irrigation Systems*, 73-82. Proceedings of an international workshop of the Farmer-Managed Irrigation Systems Network, Mendoza, Argentina, 12-15 November 1991. Colombo, Sri Lanka: International Irrigation Management Institute and Mendoza, Argentina: Instituto Nacional de Ciencia y Tecnica Hidricas.

Rap, Edwin. 2007. Cultural performance, resource flows and passion in politics: A situational analysis of an election rally in Western Mexico. *Journal of Latin American Studies* 39: 595-625.

Rauch, E. 1954. *Report to the government of Nepal on farm enterprises.* Rome, Italy: Food and Agricultural Organisation.

Razavi, S; and C. Miller. 1995. *From WID to GAD: Conceptual shifts in the women and development discourse.* Occasional Paper 51. New York, US and Geneva, Switzerland: United Nations Research Institute for Social Development.

Reason, Peter; and Hillary Bradbury (eds.) 2006. *Handbook of action research*. London, UK: Sage Publications.

Regmi, Amreeta. 2004. *Democratising micro-hydel. Structures, systems and agents in adaptive technology in the hills of Nepal.* Wageningen University Water Resources Series. New Delhi, India: Orient Longman.

Regmi, Ashok Raj. 2007. *The role of group heterogeneity in collective action: A look at the intertie between irrigation and forests. Case studies from Chitwan, Nepal.* PhD Thesis. Indiana University, US.

Regmi, Mahesh C. 1999 [1972]. *A study in Nepali economic history, 1768-1846*. Second reprint. Delhi, India: Adriot publishers.

Regmi, Mahesh C. 1999 [1977]. *Landownership in Nepal.* First Indian reprint. Delhi, India: Adriot publishers.

Reinharz, Shulamit. 2002. The principle of feminist research, a matter of debate. In: Ellen Messer-Davidow (eds.). *Disciplining feminism. From social activism to academic discourse*, 423-437. Durham, US: Duke University Press.

Reuss, Martin. 2008. Seeing like an engineer. Water projects and the mediation of the incommensurable. *Technology and Culture*, 49: 531-546.

Ribeiro, Gustavo Lins. 2009. Non-hegemonic globalizations. Alter-native transnational processes and agents. *Anthropological Theory*, 9 (3): 297-329.

Rising Nepal. 19 December 1966. Minor Irrigation Project started at various places. *The Rising Nepal*, 19 December 1966: 1.

Rising Nepal. 16 June 1966. ADB to start work by December. *The Rising Nepal*, 16 June 1966: 1.

Rising Nepal. 21 June 1966. Hydrologic Survey. View point. *The Rising Nepal*, 21 June 1966: 3.

Rising Nepal. 25 June 1966. Asian Bank to start work this year. Close door session of the Bank. *The Rising Nepal*, 25 June 1966: 1.

Rising Nepal. 29 March 1967. Irrigation potentiality of Nepal. *The Rising Nepal*, 29 March 1967.

Rising Nepal, 1969. Nepal Engineering Institute (wanted). *The Rising Nepal*, 22 June 1969.

Ritchie, Donald A. 2003. Conducting interviews. In: *Doing oral history. A practical guide*, chapter 3: 84-109. New York, US: Oxford University Press.

Robbins, Peter. 2007. The reflexive engineer: Perceptions of integrated development. *Journal of International Development*, 19: 99-110.

Rothwell, G.H. 1985. *Report on the sedimentation problems at the Narayani pump irrigation scheme, Chitwan Valley Development Project and proposals for remedial works*. Kathmandu, Nepal: Asian Development Bank.

Sachs, C. 1996. *Gendered fields. Rural women, agriculture and environment*. Colorado, US: Publisher.

SaciWaters. 2011. *Situational analysis of women water professionals in South Asia.* Hyderabad, India: South Asian Consortium for Water Resources Studies (SaciWaters).

Sakiyama, T. 1971. *International assistance to Nepalese agriculture. subsectoral and project analysis (1951-1970).* Kathmandu, Nepal: Ministry of Food and Agriculture and Rome, Italy: Food and Agriculture Organisation.

Schechner, Richard. 1986. Magnitudes of performance. In: Victor Turner and Edward Bruner (eds.). *The anthropology of experience*, 344-369. Chicago, US: University of Illinois Press.

Schechner, Richard. 2003 [1988]. *Performance theory.* Revised and expanded edition. New York, US: Routledge.

Schechner, Richard. 2006 [2002]. *Performance studies: An introduction.* Second edition. New York, US and London, UK: Routledge.

Scheer, Steven. 1996. *Communication between irrigation engineers and farmers. The case of project design in North Senegal.* PhD Thesis. Wageningen University, the Netherlands.

Scott, James C. 1998. *Seeing like a state. How certain schemes to improve the human condition have failed.* New Haven, US and London, UK: Yale University Press**.**

Shah, Tushaar. 2008. *Taming the anarchy. Groundwater governance in South Asia*. Washington DC, US: Resources for the Future and Sri Lanka, Colombo: International Water Management Institute

Sharma, Janak Lal; and Krishna Bam Malla. 1957. *Rapti Upatyaka* [Rapti Valley]. Kantipur, Nepal: Nepal Bharat Maitri Sangh.

Sharma, Khem Raj. 2004. *Irrigation conditions, visions and the concept of integrated water resources management.* Kathmandu, Nepal: Department of Irrigation.

Sharma, Prayag Raj. 2004. Introduction. In: András Höfer. 2004 [1979]. *The caste hierarchy and the state in Nepal. A study of the Muluki Ain of 1854. Second edition,* xv-xxviii. Kathmandu, Nepal: Himal Books.

Sharma, S. 1966. Home science section. In: HMG-N. 1966. *Proceedings of the agricultural conference II 1964. Part II,* 128-133. Kathmandu, Nepal: His Majesty's Government of Nepal.

Sharma, Sudhindra. 1992. *The role of organizers in participatory irrigation programs in Nepal*. MSc Thesis. Ataneo de Manila University, the Philippines.

Sharma, Sudhindra. 2001. *Procuring water. Foreign aid and rural water supply in Nepal.* Kathmandu, Nepal: Nepal Water Conservation Foundation.

Sheridan, Michael J. 2002. An irrigation intake is like a uterus: Culture and agriculture in precolonial North Pare, Tanzania. *American Anthropologist,* New series, 104 (1): 79-92.

Shivakoti, Ganesh P. 1994. Organizational effectiveness, equity and participation in user and non-user controlled irrigation systems in Nepal. *Journal of Agriculture and Animal Sciences,* 15: 27-36.

Shivakoti, Ganesh; and Elinor Ostrom (eds.). 2002. *Improving irrigation governance and management in Nepal.* Oakland, California, US: Institute for Contemporary Studies.

Shivakoti, Ganesh; George Varughese, Elinor Ostrom, Ashutosh Shukla and Ganesh Thapa (eds.). 1997. *People and participation in sustainable development. Understanding the dynamics of natural resource systems*. Proceedings of an international conference, Rampur, Nepal, 17-21 March 1996. Rampur, Nepal: Institute of Agriculture and Animal Science.

Shivakoti, Ganesh; and Shiddi Shrestha. 2005. Analysis of livelihood asset pentagon to assess the performance of irrigation systems. *Water International,* 30 (3): 363-371.

Shori, B.R.; and M.M. Mansharamani. 1957. *Report on investigations of Kosi valley scheme*. New Delhi, India: Government of India, Central Water and Power Commission.

Shrestha, Mangal Krishna. 2001. *Readings in Nepalese public administration.* Kathmandu, Nepal: Educational Enterprise.

Shrestha, Nanda R. 2008. 'Misery is my company now': Nepal's peasantry in the face of failed development. *Journal of Peasant Studies,* 35 (3): 452-475.

Shrestha, Nanda R. 2009 [1998]. *In the name of development. A reflection on Nepal*. Kathmandu, Nepal: Educational Publishing House.

Shrestha, Nanda R.; Raja P. Velu and Denis Conway. 1993. Frontier migration and upward mobility: The case of Nepal. *Economic Development and Cultural Change*, 41 (4): 787-816.

Shrestha, Reka. 2007. Role of technical education for women professionals. In: Prachanda Pradhan, Laya Prasad Uprety, Umesh Nath Parajuli and Upendra Gautam (eds.). *Irrigation in transition: Interacting with internal and external factors and setting the strategic actions.* Proceedings of the fourth international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 6-7 November 2006. Kathmandu, Nepal: Farmer Managed Systems Promotion Trust.

Shukla, Ashutosh (eds.). 1993. *Proceedings of the workshop on curriculum development in on-farm irrigation management*. Institute of Agriculture and Animal Science and the Department of Irrigation. Rampur, Nepal: Institute of Agriculture and Animal Science.

Shukla, Ashutosh; Devi Prasad Ghimire, Tej Bahadru K.C., Keshav Raj Adhikari, Jay Prakash Dutta, Neeraj Narayan Joshi, Gopi Upreti and Bharat Devkota. 2000. *Process based diagnosis of performance of irrigation management transfer in Khageri Irrigation System.* Process documentation report no.8. Rampur, Nepal: Institute of Agriculture and Animal Science.

Shukla, Ashutosh; Ganesh P. Shivakoti, Paul Benjamin and Elinor Ostrom. 2002. Toward the future of irrigation governance and management in Nepal. In: Ganesh P. Shivakoti and Elinor Ostrom (eds.). *Improving Irrigation Governance and Management in Nepal*, chapter 9: 225-241. Oakland, California, US: Institute for Contemporary Studies.

Shukla, Ashutosh; Jay Prakash Dutta, Bharat Devkota and Karun Chandra Ghimire. 1998. *A process based diagnosis of election of WUA functionaries in Nepal West Gandak Irrigation System: Election of women representatives, functionaries of executive committee and formation of regional committees.* Process documentation report no. 4 (July-August, 1998). Rampur, Nepal: Institute of Agriculture and Animal Science.

Shukla, Ashutosh; Jay Prakash Dutta, Bharat Devkota and Karun Chandra Ghimire. 1999. *Diagnosis of process and performance of irrigation management transfer in Panchakanya Irrigation System*. Rampur, Nepal: Institute of Agriculture and Animal Science.

Shukla, Ashutosh; and Khem Raj Sharma. 1997. *Participatory irrigation management in Nepal. A monograph on evolution, processes and performance.* Kathmandu, Nepal: Printers Universe.

Shukla, Ashutosh; K.P. Gajurel, Ganesh Shivakoti, Rabi Poudel, K.N. Pandit, K.R. Adhikari, Tej B. Thapa, S.M. Shakya, D.N. Yadav, N.R. Joshi and A.P. Shrestha. 1993. *Irrigation resource inventory of East Chitwan*. Irrigation Management Systems Study Group. Rampur, Nepal: Institute of Agriculture and Animal Science.

Shukla, Ashutosh; N.R. Joshi, Ganesh Shivakoti, R. Poudel and N. Shrestha. 1997. Dynamics in water rights and arbitration on water right conflicts: Cases of farmer managed irrigation systems from East Chitwan. In: Rajendra Pradhan, Franz von Benda-Beckmann, Keebet von Benda-Beckmann, H.L.J. Spiertz, Shantam S. Khadka and K. Azharul Haq (eds.). *Water rights, conflicts and policy*, 173-193. Proceedings of a workshop, Kathmandu, Nepal, 22-24 January 1996. Colombo, Sri Lanka: International Irrigation Management Institute.

Shumshere, Pashupati J.B.R. 1971. Towards an integrated policy of national integration. In: Prachanda Pradhan (eds.). *Aspects of development administration*, 40-45. Occasional paper 2. Kirtipur, Nepal: Tribhuvan University, Centre for Economic Development and Administration.

Sijapati, Suman; and K.C. Prasad (eds.). 1998. *Evaluation of irrigation management transfer: Process and performance.* Workshop proceedings, Kathmandu, Nepal, 17-18 September 1998. Kathmandu, Nepal: Department of Irrigation.

Sijapati, Suman; and Khem Raj Sharma (eds.). 2008. *Irrigation in the changing context: From concepts to action.* Proceeding report of the 'Irrigation National Workshop', Kathmandu, Nepal, 27-28 April 2008. Kathmandu, Nepal: Department of Irrigation.

Singh, Manpriet; Janwillem Liebrand and Deepa Joshi. 2014. Cultivating 'succes' and 'failure' in policy: Participatory Irrigation Management in Nepal. *Development in Practice*, 24 (2): 155-173.

Singh, Mrigendra Lal. 1984. *A comparative evaluation of planned and unplanned resettlement in Nepal*. Kirtipur, Nepal: Tribhuvan University, Centre for Economic Development and Administration.

Skar, Harald O. (eds.). 1999. *Nepal: Tharu and Tarai neighbours.* Kathmandu, Nepal: EMR Kathmandu.

Skerry, Christa A.; Kerry Moran and Kay M. Calavan. 1992. *Four decades of development: The history of US assistance to Nepal 1951-1991.* Kathmandu, Nepal: United States Agency for International Development.

Staples, Eugene S. 1992. *Forty Years: A Learning Curve. The Ford Foundation programme in India, 1952-1992*. New York, US: Ford Foundation.

Stiller, Ludwig F. 1999 [1993]. *Nepal: The growth of a nation.* Kathmandu, Nepal: Human Resources Development Centre.

Stiller, Ludwig F. 1993 [1973]. *The rise of the house of Gorkha.* Revised edition. Kathmandu, Nepal: Human Resources Development Research Centre.

Stiller, Ludwig F.; and Ram Prakash Yadav. 1978. *Planning for people.* Kathmandu, Nepal: Human Resources Development Research Centre.

Srivastava, S.K. 1999. Culture dynamics among the Rana Tharus: The past and the present. In: Harald O. Skar (eds.). *Nepal: Tharu and Tarai Neighbours*, chapter 1: 9-25. Kathmandu, Nepal: EMR Kathmandu.

Suhardiman, D.; and P.P. Mollinga. 2012. Correlations, causes and the logic of obscuration: Donor shaping of dominant narratives in Indonesia's irrigation development. *Journal of Development Studies*, 48 (7): 923-938.

Talati, Jayesh; and Janwillem Liebrand. 2005. Evolving irrigation management institutions in Sardar Sarovar Project, India. In: Prachanda Pradhan and Upendra Gautam (eds.). *Farmer managed irrigation systems and governance alternatives*, 258-283. Proceedings of the third international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 9-10 September 2004. Kathmandu, Nepal: Farmer Managed Irrigation Systems Promotion Trust.

Tamang, Seira. 2000. Legalizing state patriarchy in Nepal. *Studies in Nepali History and Society*, 5 (1): 127-156.

Tamang, Seira. 2002. Dis-embedding the sexual/social contract: Citizenship and gender in Nepal. *Citizenship Studies*, 6 (3): 309-324.

Tamang, Seira. 2003. Patriarchy and the production of homo-erotic behavior in Nepal. *Studies in Nepali History and Society*, 8 (2): 225-258.

Thapa, Manjushree. 2005. *Forget Kathmandu: An elegy for democracy.* New Delhi, India: Penguin books.

Theuvenet, S. 1953. *Report to the government of Nepal on irrigation*. FAO report no. 162. Italy, Rome: Food and Agricultural Organization (FAO).

Turner, Victor. 1974. *Dramas, fields and metaphors: Symbolic action in human society*. Ithaca, US: Cornell University Press.

Turner, Victor. 1987. *The anthropology of performance*. New York, US: Performing Arts Journal Publications.

Turner, Victor. 2008 [1969]. *The ritual process.* Second printing. New Brunswick, US and London, UK: Aldine Transaction.

Turner, Victor; and Edith Turner. 1978. *Image and pilgrimage in Christian culture.* Oxford, UK: Basil Blackwell.

Turner, Victor; and Edward Bruner (eds.). 1986. *The anthropology of experience.* Urbana and Chicago, US: University of Illinois Press.

Turnhout, E.; and S. Boonman-Berson. 2011. Databases, scaling practices, and the globalization of biodiversity. *Ecology and Society*, 16 (1): article 35.

Udas, Pranita Bhushan. 2002. Gender and policy on FMIS in the changed context. In: Prachanda Pradhan and Upendra Gautam (eds.). *Farmer managed irrigation systems in the changed context*, 230-247. Proceedings of the second international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 18-19 April 2002. Kathmandu, Nepal: Farmer Managed Irrigation Systems Promotion Trust.

Udas, Pranita Bhushan. 2011. Situational analysis of women water professionals in Nepal. In: SaciWaters. *Situational analysis of women water professinals in South Asia*, 113-136. Hyderabad, India: South Asian Consortium for Water Resources Studies (SaciWaters).

Udas, Pranita Bhushan; Dik Roth and Margreet Zwarteveen. 2014. Informal privatization of community taps: Issues of access and equity. *Local environment: The international Journal of Justice and Sustainability*, (2014): 1-18.

Udas, Pranita Bhushan; and Margreet Zwarteveen. 2010. Can water professionals meet gender goals? A case study of the Department of Irrigation in Nepal. *Gender and Development*, 18 (1): 87-97.

UN. 1955. *Multi-purpose river basin development.* Bangkok, Thailand: Economic Commission for Asia and the Far East, United Nations.

UN. 1961. *Multi-purpose river basin development. Part 2D. Water resources development in Afghanistan, Iran, Republic of Korea and Nepal.* Bangkok, Thailand: Economic Commission for Asia and the Far East, United Nations.

UN/ILO. 1992. *Promotional action to incorporate the gender dimension into selected mainstream projects in South Asia. Women in development (WID) study for the Nepal SPWP* [Special Public Works Programme]. Kathmandu, Nepal: United Nations (UN) and International Labour Organization (ILO).

Upadhyay, Bhawane. 2004. Gender aspects of smallholder irrigation technology: Insights from Nepal. *Journal of Applied Irrigation Science*, 39 (2): 315-327.

Upadhyay, Samrat. 2010. *Buddha's orphans*. New Delhi: Rupa Publications.

Uphoff, Norman. 1982. *Rural development and local organisation in Asia.* Volume I. London, UK: Macmillan Publishers.

Uphoff, Norman. 1986. *Local institutional development: An analytical sourcebook with cases*. West Hartford, US: Kumarian Press.

Upreti, Bishnu Raj. 2004. *The price of neglect. From resource conflict to Maoist insurgency in the Himalayan kingdom.* Kathmandu, Nepal: Bhrikuti Acadamic Publications.

Upreti, G.; J.P. Dutta, K.R. Adhikari, D.P. Ghimire, N.N. Joshi, T.B. Khatri-Chhetri and A. Shukla. 2002. *Impact study of rehabilitation and improvement on the performance of farmer managed irrigation systems in East Rapti Irrigation Project area of Chitwan District, Nepal.* Rampur, Nepal: Institute of Agriculture and Animal Science

USAID. 1961. *Nepal.* Kathmandu, Nepal: United States Agency for International Development (USAID).

USAID. 1972. *Nepalese-American cooperation. A summary of American aid to Nepal 1951-1972.* Kathmandu, Nepal: United States Agency for International Development (USAID).

USAID. 1986. *Thirty-five years of American assistance to Nepal. United States AID mission to Nepal.* Kathmandu, Nepal: United States Agency for International Development (USAID).

USOM. 1958. *Six-years of Nepal-American cooperation 1952-1958.* Kathmandu, Nepal: United States Operation Mission (USOM).

Verloo, Mieke. 2006. Multiple inequalities, intersectionality and the European Union. *European Journal of Women's Studies*, 13 (3): 211-228.

Verschoor, Wil. 1988. '*A small study on the women of the Mechi hills in Nepal'*. Unpublished report of the socio-economist of the Mechi Programme.

Vincent, Linden F. 1995. *Hill irrigation. Water and development in mountain agriculture*. Overseas Development Institute. Southampton, UK: Intermediate Technology Publications.

Vincent, Linden F. 2001. Contemporary issues in FMIS: Challenges to whom? Second key note speech. In: Uprendra Gautam and Shrish Rana (eds.). *Challenges to farmer managed irrigation systems,* 12-19. Proceedings of an international seminar of the Farmer Managed Irrigation Systems Promotion Trust, Kathmandu, Nepal, 28-29 March 2000. Kathmandu, Nepal: Farmer Managed Irrigation Systems Promotion Trust.

Vincent, Linden F. 2004. *Science, technology and agency in the development of droughtprone areas: A cognitive history of drought and scarcity.* PhD Thesis. Open University, UK.

Vuren, Gerrit van. 1992. Irrigation efficiency coefficients: Anchors or quick-sands? In: Geert Diemer and Jacques Slabbers (eds.). *Irrigators and engineers, essays in honour of Lusas Horst,* 97-104. Amsterdam, the Netherlands: Thesis Publishers.

Vuren, Gerrit van; and Linden F. Vincent (eds.). 2009. Special issue: The water professional of tomorrow. *Irrigation and Drainage,* 58 (S2): S161-S230.

Wagle, Narayan. 2008. *Palpasa café.* Kathmandu, Nepal: Publication Nepa~laya.

Walker, M. 1996. Home extension work among African American farm women in east Tennessee, 1920-1939. *Agricultural History*, (1996): 487-502.

WB. 2006. *Conjunctive use of groundwater and surface water.* Agricultural and Rural Development Notes. Issue 6, February 2006. Washington DC, US: World Bank (WB).

WECS. 1979. *A positioning paper on the organizational structure of the secretariat of the national water resources and energy commission.* Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS).

WECS. 1981. *Irrigation sector review.* Report no. 3/2/190981/1/1. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS).

WECS. 1982. *Performance review of public sector intensive irrigation based agricultural projects*. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS).

WECS. 1984a. *Maximizing the participation of Nepali human resource in the Ministry of Water Resources.* Report no. 3/1/190184/1/1. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS).

WECS. 1984b. *WECS comments on APROSC proposal for the establishment of a water management group*. Report no. 3/4/081083/1/3. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS).

WECS. 1994. *WERDP and WISP 1978-1994*. Report no. 5/5/310394/2/2. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS).

WECS/BCESC. 1996. *Study report on professional development opportunities for women in Nepal*. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS) and Baibhav Consultants and Environment Study Centre (BCESC).

WECS/CEMAT. 1985. *Water resources inventory study Chitwan District*. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS) and CEMAT Consultants (CEMAT).

WECS/CIDA. 1991. *Series I. Changing role of women in the water and energy sectors.* Seminar/training workshop women in water and energy development in Nepal. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS) and Canadian Cooperation Office (CIDA).

WECS/CMS. 1997. *Study on gender issues related to water and energy sectors in the central development region of Nepal*. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS) and Consolidated Management Services (CMS).

WECS/Earth. 1995. *Rapid appraisal of Narayani Lift Irrigation System in Chitwan District*. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS) and Earth consults and Masina Continental Associates (Earth).

WECS/TAEC Consult. 1998. *Final report on the study of women's participation in irrigation system*. Kathmandu, Nepal: Water and Energy Commission Secretariat (WECS) and TAEC Consult (TAEC).

Weedon, Chris. Subjects. In: Mart Eagleton (eds.). *A concise companion to feminist theory*, 111-132. Oxford, UK: Blackwell.

Wekker, Gloria. 2004. Still crazy after all those fears… Feminism for the new millennium. *European Journal of Women's Studies*, 11 (4): 487-500.

Wenger, E. 1998. *Communities of practice: Learning, meaning and identity*. Cambridge, UK: Cambridge University Press.

Wenneras, C.; and A. Wold. 1997. Nepotism and sexism in peer-review. *Nature*, 387: 341-43.

Wester, Philippus. 2008. *Shedding the waters. Institutional change and water control in the Lerma-Chapala basin, Mexico.* PhD Thesis. Wageningen University, the Netherlands.

Whatmore, S. 1988. From women's roles to gender relations. Developing perspectives in the analysis of farm women, *Sociologis Ruralis*, 28: 239-247.

Whelpton, John. 2005. *A history of Nepal.* Cambridge, UK: Cambridge University Press.

Whelpton, John. 2008. Political identity in Nepal: State, nation, and community. In: David N. Gellner, Joanna Pfaff-Czarnecka and John Whelpton (eds.). 2008 [1997]. *Nationalism and ethnicity in Nepal*, 39-78. Reprinted. Kathmandu, Nepal: Vajra Publications.

Whelpton, John; David N. Gellner and Joanna Pfaff-Czarnecka. 2008. New Nepal, new ethnicities: Changes since the mid-1990s. In: David N. Gellner; Joanna Pfaff-Czarnecka and John Whelpton (eds.). *Nationalism and ethnicity in Nepal*, xvii-xlviii. Reprinted. Kathmandu, Nepal: Vajra Publications.

White, S.C. 1997. Men, masculinities and the politics of development. *Gender and Development*, 5 (2): 14-22.

Whitehead, Stephen M. 2002. *Men and masculinities. Key themes and new directions*. Cambridge, UK and Malden, US: Polity Press.

Whitehead, Stephen M.; and Frank J. Barrett (eds.). 2001. *The masculinity reader*. Cambridge, UK and Malden, US: Polity Press.

Wilson, Gordon. 2006. Beyond the technocrat? The professional expert in development practice? *Development and Change*, 37 (3): 501-523.

Wilson, Gordon. 2008. Our knowledge ourselves: Engineers (re)thinking technology in development. *Journal of International Development*, 20: 739-750.

Yoder, Robert. 1986. *The performance of farmer-managed irrigation systems in the hills of Nepal*. PhD Thesis. Cornell University, US.

Yoder, Robert; Prachanda Pradhan and Edward D. Martin. 1988. *Recommendations for consideration in the development of Nepal's irrigation master plan. Part 1. Management and irrigation systems for effective O&M and resource mobilization. Part 2. Farmer-managed irrigation systems.* Presented at the 'Irrigation Sector Coordination Meeting', Kathmandu, Nepal, 23 February 1988. Colombo, Sri Lanka: International Irrigation Management Institute.

Yuval-Davis, Nira. 2006. Intersectionality and feminist politics. *European Journal of Women's Studies*, 13 (3): 193-209.

Zinsser, Judith P. 2002. From Mexico to Copenhagen to Nairobi: The United Nations Decade for Women, 1975-1985. *Journal of World History*, 13 (1): 139-168.

Zwarteveen, Margreet Z. 2006. *Wedlock or deadlock? Feminist attempts to engage irrigation engineers*. PhD Thesis. Wageningen University, the Netherlands.

Zwarteveen, Margreet Z. 2008. Men, masculinities and water powers in irrigation. *Water alternatives*, 1 (1): 111-130.

Zwarteveen, Margreet Z. 2010. A masculine water world: The politics of gender and identity in irrigation expert thinking. In: Rutgerd Boelens, David Getches and Armando Guevara-Gil (eds.). *Out of the mainstream: Water rights, politics and identity*, 75-98. London, UK and Washington, US: Earthscan.

Zwarteveen, Margreet Z. 2011. Questioning masculinities in water. *Economic and Political weekly*, XLVI (18): 40-48.

Zwarteveen, Margreet Z.; and Janwillem Liebrand. Forthcoming. Performing modernity: The scalar politics of irrigation development in Nepal. In: Emma S. Norman; Christina Cook and Alice Cohen (eds.). *Negotiating water governance: Why the politics of scale matter*. Surrey, UK: Ashgate Publishers.

Zwarteveen, Margreet Z.; and N. Neupane. 1996. *Free-riders or victims: Women's non-participation in irrigation management in Nepal's Chhatis Mauja irrigation scheme.* Research report 7. Colombo, Sri Lanka: International Water Management Institute.

Annexes

Annex 1: Respondents of life history interviews

No	Names and codes (not the real names)	M/F	Born	Caste (or nationality)	Education and discipline	Remarks (as per 2011)
1	Huta Ram Baidya (HRB) (real name)	M	1921	Newar	BE Agricultural Engineering, Allahabad University, India	Known as the first agricultural engineer in Nepal. He also worked on irrigation. (He has passed away late 2013).
2	Saroj Bam Upreti (SBU)	M	1936	Bahun	BE Civil Engineering, Baroda University, India	Former Deputy Director General of the DOI, now retired and doing consultancies.
3	Nadir Amisan (NA)	M	1936	Madhesi	BE Civil Engineering, Baroda University, India	Former Deputy Director General of the DOI, now retired and doing consultancies.
4	Babu Krishna Paniya (BKP)	M	1936	Newar	BE Civil Engineering, Roorkee College, India	Former Director General of the DOI, now retired.
5	Arend van Riessen (AvR) (real name)	M	± 1955	Dutch	Tropische cultuurtechniek (BSc tropical land use studies), Wageningen University, the Netherlands	Former SNV project director of the Mechi Hill Irrigation and Related Development Project (1987-1992), now irrigation consultant in Nepal.
6	Shankar Man Kumar Chhetri (SMKC)	M	1961	Chhetri	Diploma Civil Engineering, Pulchowk Campus, Nepal	Overseer and Sub-Engineer in the DOI.
7	Suresh Shajikali (SS)	M	1962	Chhetri	Civil Engineering, Roorkee College, India	Senior Division Engineer, Regional Director in the DOI.
8	Mangeetha Samratha (MS)	F	± 1962	Newar	Civil Engineering, Roorkee College, India	Senior researcher on water resources at an international research organisation in Kathmandu
9	Mahesh Basu (MB)	M	1964	Bahun	Civil Engineering, Roorkee College, India	Senior Divisional Engineer, Regional Director in the DOI.

Annex 2: Respondents of the questionnaire

Code	M/F	Service Category	DOI office	Education	Remarks
Q1MGI	M	G1	Head office, KTM	BE Agricultural	Retired
Q2MGI	M	G1	Head office, KTM	BE Civil	
Q3MGII	M	G2	Head office, KTM	BE Civil	
Q4MGII	M	G2	Central Region, KTM	BE Civil	
Q5MGII	M	G2	Chitwan (Inner Terai)	BE Civil	
Q6MGIII	M	G3	Chitwan (Inner Terai)	BE Civil	
Q7MGIII	M	G3	Chitwan (Inner Terai)	BE Mechanical	
Q8MGIII	M	G3	Central Region, KTM	Diploma Civil	
Q9MNGI	M	NG1	Chitwan (Inner Terai)	Diploma Civil	
Q10MNGI	M	NG1	Chitwan (Inner Terai)	Diploma Civil	
Q11MNGI	M	NG1	Chitwan (Inner Terai)	Diploma Electrical	
Q12MGIII	M	G3	Panchtar (Hills)	Diploma Civil	
Q13MGIII	M	G3	Chitwan (Inner Terai)	Diploma Civil	
Q14MGII	M	G2	Head office, KTM	BE Agricultural	
Q15MGIII	M	G3	Panchtar (Hills)	Diploma Civil	
Q16MNGI	M	NG1	Jhapa (Terai)	Diploma Civil	Left service
Q17MGII	M	G2	Jhapa, DA officer	BSc Agriculture	Excluded
Q18MGI	M	G1	Head office, KTM	BE Agriculture	
Q19MGI	M	G1	Central office, KTM	BE Civil	
Q20MGIII	M	G3	Central office, KTM	BA Sociology	Excluded
Q21MGIII	M	G3	Chitwan (Inner Terai)	BE Civil	
Q22FGIII	F	G3	Head office, KTM	BE Civil	
Q23MGIII	M	G3	Head office, KTM	BE Civil	
Q24MGIII	M	G3	Head office, KTM	BE Civil	
Q25MGII	M	G2	Head office, KTM	BE Agriculture	
Q26MGII	M	G2	Head office, KTM	BE Agriculture	
Q27MGII	M	G2	Head office, KTM	BE Civil	
Q28FGIII	F	G3	Head office, KTM	BE Civil	
Q29FGIII	F	G3	Head office, KTM	BE Agriculture	
Q30FGIII	F	G3	Head Region, KTM	BE Civil	
Q31FGIII	F	G3	Head office, KTM	BE Civil	
Q32FGIII	F	G3	Central Region, KTM	BE Civil	
Q33FGII	F	G2	Head office, KTM	Diploma Economy	Excluded
Q34FGIII	F	G3	Head office, KTM	Diploma Archit.	
Q35MGIII	M	G3	Head office, KTM	BE Civil	
Q36MGIII	M	G3	Head office, KTM	Diploma Civil	
Q37MGII	M	G2	Panchtar (Hills)	BE Agriculture	Left service
Q38FGIII	F	G3	Head office, KTM	BE Agriculture	
Q39FGIII	F	G3	Head office, KTM	BE Civil	

Abbreviations: Q = Questionnaire; M = Male; F = Female; GI or G1 = Gazetted first class; GII or G2 = Gazetted second class; GIII or G3 = Gazetted third class; NGI or NG1 = Non-gazetted first class; KTM = Kathmandu; BE = Bachelor Engineering.

Annex 3: Libraries and documentation centres

No	Library, office or documentation centre	Remarks
1	Tribhuvan University (TU) (Kirtipur)	Government
2	Nepal National Library (near Pulchowk)	Government
3	National Archive, Department of Archaeology (near Maitighar)	Government
4	Institute of Agriculture and Animal Science (IAAS) (Chitwan, Rampur).	Government
5	The library of the old 'IMSSG group' (Irrigation Management Systems Study Group (IMSSG) (1988-2002), located at the IAAS campus (Chitwan, Rampur)	Government
6	National Agriculture Research Council (NARC) (Pritvhi Path) General collection.	Government
7	National Agriculture Research Council (NARC) (near Satdobato). Engineering subjects.	Government
8	The old 'APROSC library' (Agricultural Projects Services Centre), located in the NARC library (general collection) (Pritvhi Path)	Government
9	Central Bureau of Statistics (CBS) (Thapathali)	Government
10	Ministry of Irrigation (MOI) & Water and Energy Commission Secretariat (WECS) (Singa Durbar)	Government
11	Department of Irrigation (DOI) (Jawalakhel)	Government
12	Divisional Irrigation Office, Chitwan (Bharatpur)	Government
13	District Development Committee (DDC) office, Ilam (Ilam)	Government
14	District Development Committee (DDC) office, Taplejung (Taplejung)	Government
15	Gorkhapatra Publishers (New Road)	Government
16	Indian library (near New Road)	
17	World Bank (WB) documentation centre	Multilateral
18	Asian Development Bank (ADB) documentation centre	Multilateral
19	Winrock Nepal (Old Baneswor)	INGO
20	United States Agency for International Development (USAID) (Maharajgunj) (obtained some historical documents)	INGO
21	Nepal Engineering College (nec), (Bhaktapur and Balkhu)	Private
22	Madan Puraskar Pustakalaya (Patan Dhoka)	Private
23	SILT Consultants (Old Baneswor)	Private
24	CEMAT Consultants (between Sanepa and Kopundol)	Private
25	GEOCE Consultants (Sanepa)	Private
26	EAST Consult	Private
27	MULTI Consultants (ring road Maharajgunj)	Private
28	Dr. Prachanda Pradhan (located in the nec-library) (Bhaktapur)	Private
29	Mr. Madhav Belbase	Private
30	Mr. Arend van Riessen	Private

Annex 4: Population growth and irrigation development in Nepal (1910-2010)

Year	Total irrigated area (ha) (A)	Government assisted and developed area (ha) (B)	Non-assisted area (ha) (C) = (A) – (B)	Population in Nepal (CBS, 2003)
1910	(1) 114.286	-	114.286	(1911) 5.638.749
1915	(1) 114.286	-	114.286	
1920	(1) 114.286	-	114.286	5.573.788
1925	(1) 114.286	(7) 6.500	107.786	
1930	(1) 160.000	(7) 6.500	153.500	5.532.574
1935	(1) 160.000	(7) 6.500	153.500	
1940	(1) 160.000	(7) 6.500	153.500	(1941) 6.243.649
1945	(1) 160.000	(7) 6.500	153.500	
1950	(1) 171.429	(7) 6.500	164.929	(1951/52) 8.256.625
1955	(1) 171.429	(7) 6.500	164.929	
1960	(1) 188.571	(7) 8.995	179.576	(1961) 9.412.996
1965	(1) 188.571	(7) 13.336	175.235	
1970	(1) 222.587	(7) 33.266	189.591	(1971) 11.555.983
1975	(2) 230.000	(7) 36.770	193.230	
1980	(2) 583.900	(7) 98.503	485.397	(1981) 15.022.839
1985	(2) 760.000	(8) 275.752	484.248	
1990	(3) 943.000	(3) 453.000	490.000	(1991) 18.491.097
1995	(2) 1.143.000	(9) 615.039	518.961	
2000	(4) 1.153.800	(9) 777.078	376.722	(2001) 23.151.423
2005	(5) 1.251.406	(5) 939.117	312.289	
2010	(6) 1.312.610	(6) 1.028.262	284.348	(10) 29.000.000

Explanation:

(1) Estimate. Data from East-Chitwan district have been used for reference (DOI/Nippon Koei/SILT, 1990). This study documented irrigation development since 1900. The numbers given in this study are considered to represent half a Terai district. There are 20 Terai districts in Nepal, so the numbers have been multiplied by 40 to obtain an estimate for the Terai for 1910 to 1970.
(2) AQUASTAT (FAO), visited at 18 October 2012. It appears an estimate. The year 1970 above is mentioned as 1970 in the AQUASTAT database, the year 1980 as 1982; the year 1985 as 1985; and the year 1995 as 1994.
(3) DOI/WB/UNDP, 1989. Irrigation Master Plan.
(4) CBS, 2006. Agricultural Monograph. Agricultural census of 2001/2002, listed above for the year 2000.
(5) DOI/CERD, 2007. Database for Irrigation Development in Nepal (DBID). Data based on the fiscal year of 2005/2006, listed above for the year 2005.
(6) ADB, 2012a. Irrigated Agriculture and Water Resources Assessment Report.
(7) WECS, 1981. Irrigation Sector Review. See p.45-46.
(8) Estimate. The total government assisted area for 1980 and 1990 is known (WECS, 1981; DOI/WB/UNDP, 1989). The difference has been divided by two, and added to the figure of 1980 to derive at an estimate for 1985.

(9) Estimate. The total government assisted area for 1990 and 2005 is known (DOI/WB/UNDP, 1989; DOI/CERD, 2007). The difference has been divided by three, and added one time and two times, to derive at estimates for 1995 and 2000 respectively.
(10) Estimate. Encyclopaedia Britannica (digitally available, visited 16 December 2009).

Note: See for comparison the data in irrigation development presented in World Rice Statistics (IRRI).

Annex 5: Annual irrigation expenditure and agricultural yield (1950-2010)

Year	Annual total irrigation sector expenditure (NRs) [1] (A)	Annual recurrent expenditure (millions) (NRs) [2] (B)	Official exchange value (NRs/ USD) [3] (C)	Annual total irrigation sector expendi-ture (millions) (USD) [4] (D) = (A)/(C)	Annual recurrent irrigation sector expendi-ture (millions) (USD) (E) = (B)/(C)	Rough rice yield (ton/ha) [5]
1950	0	0	7.10	0	0	1.90
1951	0	0	8.30	0	0	1.90
1952	0	0	6.70	0	0	1.90
1953	360.000	0.02	6.10	0.06	0	1.90
1954	360.000	0.02	7.10	0.05	0	1.90
1955	360.000	0.02	8.31	0.04	0	1.90
1956	785.000	0.04	6.69	0.12	0.01	1.90
1957	818.000	0.04	6.25	0.13	0.01	1.90
1958	549.342	0.03	6.61	0.08	0	1.90
1959	13.049.342	0.65	7.17	1.82	0.09	1.90
1960	13.663.267	0.68	7.50	1.82	0.09	1.90
1961	13.671.600	0.68	7.62	1.79	0.09	1.94
1962	14.073.350	0.70	7.62	1.85	0.09	1.93
1963	14.051.850	0.70	7.62	1.84	0.09	1.93
1964	48.986.683	2.45	7.62	6.43	0.32	2.00
1965	48.475.083	2.42	7.62	6.36	0.32	1.99
1966	50.593.083	2.53	7.62	6.64	0.33	1.82
1967	50.102.000	2.51	8.03	6.24	0.31	1.84
1968	58.573.000	2.93	10.13	5.78	0.29	1.87
1969	58.803.333	2.94	10.13	5.80	0.29	1.91
1970	58.778.333	2.94	10.13	5.80	0.29	1.95
1971	65.618.467	3.28	10.13	6.48	0.32	1.95
1972	64.460.134	3.22	10.13	6.36	0.32	1.76
1973	70.158.959	3.51	10.47	6.70	0.34	1.97
1974	74.000.000	3.70	10.56	7.01	0.35	1.98
1975	98.100.000	4.91	11.00	8.92	0.45	2.07
1976	127.400.000	6.37	12.50	10.19	0.51	1.89
1977	142.100.000	7.11	12.50	11.37	0.57	1.81
1978	226.300.000	11.32	12.11	18.69	0.93	1.85
1979	232.700.000	11.64	12.00	19.39	0.97	1.64
1980	288.200.000	14.41	12.00	24.02	1.20	1.93
1981	359.600.000	17.98	12.34	29.14	1.46	1.97
1982	487.400.000	24.37	13.24	36.81	1.84	1.45
1983	487.400.000	24.37	14.55	33.50	1.67	2.07
1984	652.200.000	32.61	16.46	39.62	1.98	1.97
1985	846.700.000	42.34	18.25	46.39	2.32	2.02
1986	673.100.000	33.66	21.23	31.71	1.59	1.78

1987	676.771.250	33.84	21.82	31.02	1.55	2.10
1988	680.325.000	34.02	23.29	29.21	1.46	2.26
1989	683.937.500	34.20	27.19	25.15	1.26	2.37
1990	687.550.000	34.38	29.37	23.41	1.17	2.41
1991	691.162.500	34.56	37.26	18.55	0.93	2.28
1992	694.777.500	34.74	42.72	16.26	0.81	2.05
1993	698.387.500	34.92	48.61	14.37	0.72	2.41
1994	702.000.000	20.00	49.40	14.21	0.40	2.12
1995	720.000.000	20.00	51.89	13.88	0.39	2.39
1996	650.000.000	15.00	56.69	11.47	0.26	2.46
1997	565.000.000	15.00	58.01	9.74	0.26	2.42
1998	610.000.000	15.00	65.98	9.25	0.23	2.44
1999	610.000.000	15.00	68.24	8.94	0.22	2.47
2000	785.000.000	15.00	71.09	11.04	0.21	2.70
2001	610.000.000	40.00	74.95	8.14	0.53	2.75
2002	405.000.000	90.00	77.88	5.20	1.16	2.68
2003	410.000.000	75.00	76.14	5.38	0.99	2.68
2004	380.000.000	60.00	73.67	5.16	0.81	2.86
2005	418.000.000	55.00	71.37	5.86	0.77	2.78
2006	490.000.000	55.00	72.76	6.73	0.76	2.72
2007	520.000.000	65.00	66.42	7.83	0.98	2.56
2008	705.000.000	75.00	69.76	10.11	1.08	2.78
2009	865.000.000	75.00	77.55	11.15	0.97	2.91
2010	550.000.000	75.00	73.16	7.52	1.03	2.72

Explanation:

(1) For the years 1950-1973, the annual irrigation sector expenditure has been estimated by adding up the investment cost of each irrigation project as given in Poudel (1986). The total investment cost were divided over the years that the project ran. For the years 1974-1986, the numbers have been used as given in Barker and Lohani, 1987 cited in Shukla and Sharma, 1997 (page 6). For the years 1987-1993, the numbers have been estimated based on taking the year 1986 and 1994 as reference, and assuming a gradual growth. For the years, 1994-2010, the numbers presented in the ADB study (2012a) have been taken as a reference.
(2) For the years, 1950-1993, the numbers have been estimated at 5% of the capital (or total) budgets (see the second column). Presumably, recurrent budgets were lower in most of the years. The data given in Poudel (1986) suggest that the recurrent budget in 1986 and the previous year(s) was less than 0.5% of the total irrigation sector budget. For the years, 1994-2010, the numbers presented in the ADB study (2012a) have been taken as a reference.
(3) Official exchange rate taken from World Rice Statistics (IRRI online database), visited on 10 November 2012.
(4) Rough rice yield, data of the FAO given in World Rice Statistics (IRRI online database), visited on 10 November 2012.
(5) World Rice Statistics (IRRI online database).

Annex 6: Status of education in Nepal

Level of education	Number of schools	Public schools (%)	Student enrolment	Girl enrolment (%)	Number of teachers	Female teachers (%)
Primary	27.525	77%	4.502.697	47%	101.483	30%
Lower secondary	8.471	68%	1.374.796	46%	25.962	16%
Secondary	5.039	62%	587.177	46%	20.232	9%
Higher secondary	1.018	53%	364.404	43%	-	-
University education	520	16%	141.636	33%	-	-

Source: Ministry of Education and Sport, 2007 cited in Bhattarai, 2009
Note: Actual class attendance goes often unchecked, particularly in public schools. This may imply that the numbers of student enrolment and percentage of girl enrolment are unrealistic.

Annex 7: List of administrative services in the civil service of Nepal (2007)

No.	Service
1	Nepal Economic Planning and Statistics Service
2	Nepal Engineering Service
3	Nepal Agricultural Service
4	Nepal Judicial Service
5	Nepal Foreign Service
6	Nepal Administration Service
7	Nepal Audit Service
8	Nepal Forestry Service
9	Nepal Miscellaneous Service
10	Nepal Education Service

Source: Civil Service (Second Amendment) Act, 2007; p.4 (English translation).

Annex 8: Numbers on civil services in South Asia

The size of the civil service in some South Asian countries

Country	Year	Number	Level
India	1979	3.700.000	Central level
Bangladesh	1977	465.330	State and provincial level
Pakistan	1977	111.692	Federal level
Sri Lanka	1980	400.000	Public Service
Nepal	1989	90.000	Civil Service

Source: Shrestha, 2001: 35

Annex 9: Facts and figures of the civil service in Nepal

Table 1: Number of personnel in the civil service of Nepal by age and gender

Age group	Male	Female	Total
< 20	40	10	50
21-25	1.565	705	2.270
26-30	3.457	1.271	4.728
31-35	6.495	1.735	8.230
36-40	9.283	2.157	11.440
41-45	13.175	2.696	15.871
46-50	14.604	1.791	16.395
51-55	14.764	1.288	16.052
55 <	4.828	480	5.308
Total	**68.211**	**12.133**	**80.344**

Source: Department of Civil Service Personnel Records, website visited 22-5-2013.

Table 2: Number of gazetted personnel in the civil service of Nepal by gender

Class	Male	Female	Total
Non-gazetted classes *	66.035	5.742	71.777
Sub-total	**66.035**	**5.742**	**71.777**
Third class gazetted	6.005	371	6.376
Second class gazetted	1.823	68	1.891
First class gazetted	227	10	237
Special class gazetted	60	3	63
Sub-Total	**8.115**	**452**	**8.567**
Total	**74.150**	**6.194**	**80.344**

Source: Poudyal (2009: 58), based on Department of Civil Service Personnel Records, 2009.
* Estimation: UN (2000) reports 8% of women in non-gazetted classes.

Table 3: Number of gazetted personnel in the civil service of Nepal by caste/ethnicity

Class	B/C	Newar	Janajati	Madhesi	Dalit	Total
Third class gazetted	4.034	703	190	538	60	5.525
Second class gazetted	1.444	374	70	237	11	2.136
First class gazetted	293	68	3	30	3	397
Special class gazetted	30	7	1	0	0	38
Total	**5.801**	**1.152**	**264**	**805**	**74**	**8.096**
Total (percentage)	72%	14%	3%	10%	1%	

Source: Poudyal (2009: 58), based on Department of Civil Service Personnel Records, 2007.

Table 4: Education level of personnel in the civil service of Nepal

Education	Total	Total (percentage)
Under SLC (School Leaving Certificate)	9.468	13%
SLC (School Leaving Certificate)	25.936	36%
Higher Secondary Education/ Diploma	17.345	24%
Bachelor	14.453	20%
Master	4.886	7%
PhD	52	0.1%
Total	**72.140**	

Source: Department of Civil Service Personnel Records, website visited 22-5-2013.

Annex 10: Student enrolment for engineering at various universities

University	Engineering colleges			Student enrolment capacity
	Constituent ('public')	Affiliated ('private')	Total	
Tribhuvan University (IOE)	4	7	11	1.638
Kathmandu University	1	0	1	179
Purbanchal University	1	8	9	1.078
Pokhara University	0	9	9	1.522
Total	**6**	**24**	**30**	**4.417**

Source: Nepal Engineering Council, 2007 cited in Bhattarai, 2009
Note: In 2011, the Nepal Engineering Council had registered 33 colleges in total.

Annex 11: Estimates of total student enrolment in engineering in Nepal in 2007

Programme of study	Student enrolment
Civil engineering	1.670
Electronics and communication engineering	1.050
Computer engineering	700
Electrical engineering	310
Architecture	200
Mechanical engineering	100
Electronics and electrical engineering	100
Other branches of engineering (e.g. agriculture, industrial, geometrics)	287
Total	**4.417**

Source: Bhattarai, 2009:5 (based on his own estimates)

Annex 12: Government spending on higher education in engineering in Nepal

Fiscal year	**Budget for the education sector** (% of government budget)	**Budget for higher education** (% of education budget)	**Budget for engineering education** (% of higher education budget)
1999/2000	13.2%	15.8%	0.31%
2001/2002	14.1%	11.9%	0.21%
2003/2004	15.3%	9.8%	0.12%

Source: Bhattarai, 2009

Annex 13: Foreign scholarships for Nepalese in engineering (1985-1988)

Table 1: Scholarship positions in engineering as approved by the NPC

No.	Country	1985/86			1986/87		
		Training	**Bachelor**	**Master & PhD**	**Training**	**Bachelor**	**Master & PhD**
1	India	3	* 69	9	4	* 66	6
2	Malaysia	4	-	-	1	-	1
3	Thailand	-	-	-	3	-	-
4	Japan	6	-	-	28	-	1
5	China	-	11	2	-	9	2
6	USSR	-	51	1	12	50	1
7	UK	8	7	12	-	-	-
8	Australia	-	-	-	-	-	1
9	West Germany	6	-	-	8	1	2
10	The Netherlands	7	6	4	6	4	6
11	Italy	2	1	-	-	-	-
12	Others	8	26	6	3	20	3
	Total:	**44**	**171**	**34**	**62**	**150**	**26**

Source: Human Resources and Manpower Planning Division, NPC, HMG-N cited in DHV/APROSC/WB, 1989: 11.

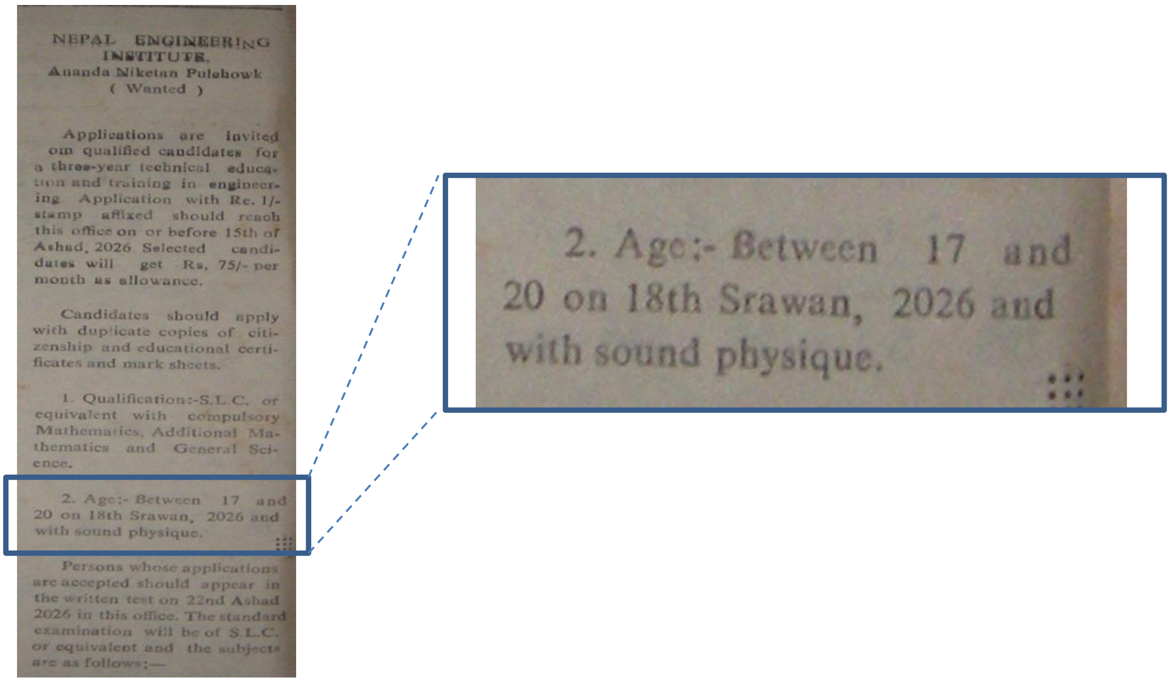
* This number includes the students sent to Roorkee University under UNDP scholarships.

Table 2: Scholarships for Bachelor level engineering education granted to Nepalese

No.	Country	Subject	1986/87	1987/88
1	India	Civil Engineering	22	20
		Agricultural Engineering	2	1
2	Bangladesh	Civil Engineering	5	4
3	Pakistan	Civil Engineering	8	2
4	China	Irrigation and Drainage Engineering	1	2
5	USSR	Civil and Industrial Engineering	19	14
		Hydraulic and Power Plant Engineering	1	2
		Hydrology and Geology Engineering	1	3
		Geology	2	2
6	Yugoslavia	Civil Engineering	2	-
		Total:	**63**	**50**

Source: DHV/APROSC/WB, 1989: 11.

Annex 14: Call for engineers in 1969



NEPAL ENGINEERING INSTITUTE,
Ananda Niketan Pulchowk
(Wanted)

Applications are invited om qualified candidates for a three-year technical education and training in engineering Application with Re. 1/- stamp affixed should reach this office on or before 15th of Ashad, 2026 Selected candidates will get Rs. 75/- per month as allowance.

Candidates should apply with duplicate copies of citizenship and educational certificates and mark sheets.

1. Qualification:-S.L.C. or equivalent with compulsory Mathematics, Additional Mathematics and General Science.

2. Age:- Between 17 and 20 on 18th Srawan, 2026 and with sound physique.

Persons whose applications are accepted should appear in the written test on 22nd Ashad 2026 in this office. The standard examination will be of S.L.C. or equivalent and the subjects are as follows;—

2. Age:- Between 17 and 20 on 18th Srawan, 2026 and with sound physique.

Source: Rising Nepal, 22 June 1969

Annex 15: Student enrolment data for diploma engineering in Nepal

Table 1: Overview of collected data

No	Engineering college	Diploma Engineering	Years	Remarks
1	IOE – Pulchowk Campus	Civil	1981-1997	(1) 2-year Diploma CE started in 1954 and 3-year Diploma CE started in 1959; data before 1980 are missing. (3) Diploma CE at Pulchowk shifted to Thapathali after 1997.
2	IOE – Thapathali Campus	Civil	1998-2010	(1) Diploma CE started in 1997.
		Mechanics	1973-2010	(1) Complete data available; not presented in this book.
3	IOE – Dharan Campus (ERC)	Civil	1990-2010	(1) Complete data.
		Mechanical	1990-2010	(1) Complete data available; not presented in this book.
4	IOE – Pokhara Campus (WRC)	Civil	1987-2010	(1) Complete data.
		Mechanical	1987-2010	(1) Complete data available; not presented in this book.
		Electrical	1987-2010	(1) Complete data available; not presented in this book
	CTEVT mentions in total 150 colleges and technical schools for diploma CE, many of which started after 1990. The IOE campuses constitute the largest colleges and are estimated to cover between 30% and 50% of the total seats for diploma CE in Nepal.			

Note: IOE = Institute of Engineering; ERC = Eastern Region Campus; WRC = Western Region Campus

Table 2: Sum of students for Diploma Civil Engineering 1980-2010 in Nepal [(1)]

BS	AD	B/C		Newar		Janajati		Madhesi		Dalit		Total		Total
		M	F	M	F	M	F	M	F	M	F	M	F	
2037	[(2)] 1980	-	-	-	-	-	-	-	-	-	-	262	0	262
2038	1981	107	0	47	0	34	0	73	0	1	0	262	0	262
2039	1982	118	0	54	0	40	0	88	0	0	0	300	0	300
2040	1983	157	1	85	0	45	1	77	0	3	0	367	2	369
2041	1984	193	0	82	0	36	1	50	0	4	0	365	1	366
2042	1985	116	0	60	1	27	0	55	0	1	0	259	1	260
2043	1986	105	6	59	12	19	2	33	2	2	0	218	22	240
2044	1987	110	5	73	18	26	3	39	0	0	0	248	26	274
2045	1988	138	9	65	16	31	2	35	1	1	0	270	28	298
2046	1989	143	6	76	16	22	1	35	0	2	0	278	23	301
2047	1990	143	11	58	15	33	3	61	0	2	0	297	29	326
2048	1991	139	8	76	12	25	5	38	0	0	0	278	25	303
2049	1992	10	0	4	0	1	0	9	0	0	0	24	0	24
2050	1993	146	8	91	21	31	7	31	2	0	0	299	38	337
2051	1994	124	5	63	14	27	0	26	1	0	0	240	20	260
2052	1995	123	5	58	13	18	5	41	0	1	0	241	23	264
2053	1996	86	3	30	9	15	2	35	1	1	0	167	15	182
2054	1997	117	5	22	6	26	41	27	0	1	0	193	52	245
2055	1998	105	11	35	10	27	5	88	4	1	0	256	30	286
2056	1999	128	15	35	7	35	2	110	1	3	0	311	25	336
2057	2000	161	17	56	9	26	5	110	0	1	0	354	31	385
2058	2001	146	16	31	2	36	3	88	1	5	0	306	22	328
2059	2002	150	18	28	2	29	4	53	0	2	0	262	24	286
2060	2003	134	15	31	10	28	5	48	1	7	0	248	31	279
2061	2004	134	10	46	8	28	7	49	0	3	0	260	25	285
2062	2005	145	17	52	11	35	3	54	1	1	0	287	32	319
2063	2006	166	17	45	10	46	4	46	0	2	0	305	31	336
2064	2007	163	28	36	9	35	2	57	2	4	0	295	41	336
2065	2008	162	19	26	10	31	6	76	1	5	0	300	36	336
2066	2009	126	15	29	6	40	7	56	1	8	0	259	29	288
2067	2010	102	13	25	5	27	6	57	2	3	0	214	26	240

Notes:

[(1)] The stabilization/decline of student enrolment for diploma CE ***does not reflect an actual decline in Nepal*** because there are many more colleges and technical schools for diploma CE.

[(2)] The total number of male and female students in 1980 is assumed to have been the same as in 1981.

Annex 16: Student enrolment data for bachelor engineering in Nepal

Table1: Overview of collected data

No	Engineering college	Bachelor Engineering	Years	Remarks
1	IOE – Pulchowk Campus	Civil	1986-2010	(1) B. CE started in 1978; data 1978-1985 and 1989-1993 are missing/not available.
		Electrical	1994-2010	(1) Complete data; 1994 was starting year; not presented here.
		Mechanical	1995-2010	(1) Complete data; 1995 was starting year; not presented here.
2	IOE – Thapathali Campus	Civil	2009-2010	(1) Complete data: BE Civil started in 2009.
3	IOE – Dharan Campus (ERC)	Civil	2004-2010	(1) Complete data; BE Civil started in 2004.
		Agriculture	2000-2010	(1) Complete data; BE Agri. Engineering is the only programme in Nepal, started in 2000
4	IOE – Pokhara Campus (WRC)	Civil	1999-2010	(1) Complete data; BE Civil started in 1999.
5	Kathmandu University (KU)	Civil	2009-2010	(1) Complete data: BE Civil started in 2009.
		Electrical	1994-2010	(1) Complete data; 1994 was starting year; not presented here.
		Mechanical	1994-2010	(1) Complete data; 1994 was starting year; not presented here.
6	Nepal Engineering College (NEC), KTM	Civil	1994-2009	(1) Compete data; 1994 was starting year; 2010 is missing.
7	Kantipur Engineering College, KTM.	Civil	1998-2010	(1) Complete data; 1998 was starting year.
8	Advance College of Engineering and Management (ACEM), KTM.	Civil	2000-2010	(1) Complete data; 2000 was starting year.
		Electrical	2009-2010	(1) Complete data; 2009 was starting year; not presented here.
9	Himalaya College of Engineering (HCE), KTM	Civil	2008-2010	(1) Complete data; 2008 was starting year.
10	Khowpa College of Engineering (KhCE), Bhaktapur.	Civil	2008-2010	(1) Complete data; 2008 was starting year.
		Electrical	2008-2010	(1) Complete data; 2008 was starting year; not presented here.
11	Khowpa Engineering College (KEC), Bhaktapur.	Civil	2001-2010	(1) Complete data; 2001 was starting year.
	The NEC had registered in 2011 in total 33 engineering colleges in the country. The campuses of the IOE tend to be the biggest but private colleges also can have 100 students per cohort. These data cover thus about one-third of the engineering colleges in Nepal. Note: data from the Institute of Agriculture and Animal Science (IAAS) is missing (relatively an old establishment) and from Purbanchal University and Pokhara University.			

Note: IOE = Institute of Engineering; ERC = Eastern Region Campus; WRC = Western Region Campus

Table 2: Sum of students for BE civil and agricultural engineering 1985-2010 in Nepal [1]

BS	AD	B/C		Newar		Janajati		Madhesi		Dalit		Total		Total
		M	F	M	F	M	F	M	F	M	F	M	F	
2042	[2] 1985	-	-	-	-	-	-	-	-	-	-	45	3	48
2043	1986	25	0	14	2	3	1	3	0	0	0	45	3	48
2044	1987	46	1	17	1	0	0	3	0	0	0	66	2	68
2045	[3] 1988	56	0	14	2	4	0	11	0	0	0	85	2	87
2046	[3] 1989	56	0	14	2	4	0	11	0	0	0	85	2	87
2047	[3] 1990	56	0	14	2	4	0	11	0	0	0	85	2	87
2048	[3] 1991	56	0	14	2	4	0	11	0	0	0	85	2	87
2049	[3] 1992	56	0	14	2	4	0	11	0	0	0	85	2	87
2050	[3] 1993	56	0	14	2	4	0	11	0	0	0	85	2	87
2051	1994	73	2	51	9	8	1	15	0	0	0	147	12	159
2052	1995	84	5	38	1	9	0	15	0	0	0	146	6	152
2053	1996	85	4	38	5	7	0	11	0	0	0	141	9	150
2054	1997	74	4	40	5	9	0	20	3	0	0	143	12	155
2055	1998	107	6	52	11	12	0	28	0	1	0	200	17	217
2056	1999	134	10	78	11	18	3	34	1	0	0	264	25	289
2057	2000	123	9	57	14	13	2	31	1	0	0	224	26	250
2058	2001	129	11	72	24	18	0	26	1	0	0	245	36	281
2059	2002	166	25	101	24	18	2	48	2	0	0	333	53	386
2060	2003	202	23	74	25	27	4	38	2	1	1	342	55	397
2061	2004	225	20	78	21	20	6	46	2	3	1	372	50	422
2062	2005	229	26	88	20	24	0	47	2	1	0	389	48	437
2063	2006	280	35	131	31	47	2	40	4	2	1	500	73	573
2064	2007	304	35	118	32	26	9	71	2	1	0	520	78	598
2065	2008	387	36	139	44	42	4	84	4	4	0	656	88	744
2066	2009	529	60	163	51	42	2	109	4	8	1	851	118	969
2067	[4] 2010	506	79	193	50	58	8	98	13	7	1	862	151	1013

Notes:

[1] In 2007, the total capacity for civil engineering was estimated at 1670. Most growth has occured in the last decade (2000-2010), which means that the data reflect the growth in engineering education to a reasonable extent reasonably.

[2] Data for 1985 are estimated by using the data of 1986.

[3] The year 1987 has been used as reference here.

[4] The data of Nepal Engineering College for 2010 are based on 2009.

Annex 17: Student enrolment data for master engineering and/or science in Nepal

Table 1: Overview of collected data

No	Engineering college	Master degree	Years	Remarks
1	IOE – Pulchowk Campus	Water Resources Engineering	1998-2010	(1) Complete data; 1998 was the starting year. (2) Under the Department of Civil Engineering.
		Environmental Engineering	1998-2010	(1) Complete data; 1998 was the starting year. (2) Under the Department of Civil Engineering.
		Geo-technical Engineering	2002-2010	(1) Complete data; 2002 was the starting year. (2) Under the Department of Civil Engineering.
		Renewable Energy Engineering	2002-2010	(1) Complete data; 2002 was the starting year; not presented here.
2	Nepal Engineering College	Interdisciplinary Water Resources Management	2007-2010	(1) Complete data, 2007 was the starting year.
		Natural Resources Management	2000-2010	(1) Complete data, 2000 was the starting year.
	These data can be considered to cover all master degree programmes in Nepal on water resources engineering or water related discipline, except for recent master degree programmes on environment management and natural resources management. Kathmandu University and Purbanchal University do not have master degree programmes on water related topics. Private engineering colleges basically have only bachelor level education.			

Table 2: Sum of students for MSc in Water Related Disciplines 1998-2010 in Nepal [(1)]

BS	AD	B/C		Newar		Janajati		Madhesi		Dalit		Total		Total
		M	F	M	F	M	F	M	F	M	F	M	F	
2055	1998	17	0	10	0	3	0	1	0	0	0	31	0	31
2056	1999	10	0	4	0	1	0	1	0	0	0	16	0	16
2057	2000	37	1	12	1	1	0	10	0	0	0	60	2	62
2058	2001	24	1	14	0	4	0	6	0	0	0	48	1	49
2059	2002	27	0	17	1	2	0	7	0	0	0	53	1	54
2060	2003	29	2	8	0	5	0	11	1	0	0	53	3	56
2061	2004	28	1	6	3	2	0	0	0	0	0	36	4	40
2062	2005	20	3	5	3	0	0	2	0	0	0	27	6	33
2063	2006	18	1	9	4	1	1	6	0	0	0	34	6	40
2064	2007	35	8	11	5	2	0	7	0	0	0	55	13	68
2065	2008	28	4	18	7	5	0	4	0	0	0	55	11	66
2066	2009	45	13	11	5	7	1	10	0	1	0	74	19	93
2067	2010	62	5	21	2	7	0	8	0	0	0	98	7	105

Notes:

[(1)] The data reflect the growth in higher engineering education in Nepal accurately because data have been collected for all master degree programmes in water related disciplines.

Annex 18: Scholarships available for Nepalese in the NRM sector around 2000

The list of organizations below have provided scholarships for the level of higher secondary education (intermediate level), BSc, MSc and PhD. This list focusses on agriculture and forestry. Many of these scholarships were accessible *for both men and women students*.

No.	**International organizations**
1	Asian Institute of Technology, Thailand (AIT)
2	Australian Aid (AUSAID)
3	Center for International Development Agency, Canada (CIDA)
4	Colombo Plan, mainly Commenwealth countries.
5	Dutch government, the Netherlands
6	Embassy of India
7	International Plant Genetic Research Institute, Rome; part of CGIAR consortium.
8	Nepal-Australia Community Forest Project (NACFP)
9	Natural Resource Management Sector Assistance Project (NARMSAP), under Danida, Denmark.
10	Norwegian Agency for International Cooperation
11	Nepal-UK Community Forestry Project
12	New Zealand Overseas Development Assistance
13	Prince Bernard-Switzerland
14	United States Agency for International Development (USAID)
15	Winrock International, funded by USAID, Ford Foundation, Rockefeller.
16	World Wildlife Fund (WWF).
17	Cooperative for American Relief Everywhere (CARE)
No.	**National organizations**
18	His Majesty's Government of Nepal (HMG-N)
19	Bagmati Integrated Watershed Management Project (BIWMP)
20	Environment and Forests Enterprise Activity (EFEA)
21	King Mahendra Trust for Nature Conservation
22	Royal Nepal Academy for Science and Technology
23	Tree Improvement and Silviculture Center
24	Tribhuvan University
25	Agricultural Development Bank/Nepal (ADB-N)

Source: Kamarcharya *et al*., 2003; Devkota, 2003.

Annex 19: Overview of regulatory institutions in engineering

1	**Council for Technical Education and Vocational Training (CTEVT)**	
	Established:	1989
	Registered members	Not applicable
	Registered schools/colleges	179 (for TSLC or diploma level education)
	Organizational setup	Assembly of 24 members – consisting of representatives of the Ministry of Education, National Planning Commission, representatives of business and industry, and the technical schools. Council of 9 members – chaired by the Ministry of Education.
	Goal	Quality assurance of technical training. Regulation of standards, admission and exams. Prepare competent workforce. Advice to the government of Nepal.
	Legal backing	Council for Technical Education and Vocational Training Act, 1989, promulgated by HMG-N.
	History	Colombo Plan Staff College for Technician Education (CPSC), an international inter-governmental organization, established in 1969, provided institutional backing.

2	**Nepal Engineering Council (NEC)**	
	Established	1999
	Registered members	15.343
	Registered colleges	33 (for BSc degree education)
	Organizational setup	Council of 12 members – chaired by the President of the Nepal Engineers' Association (NEA), five members of NEA, one Campus Chief of Engineering Colleges, representative of IOE, and other nominated engineers. Cooperation with the 'University Grants Commission' in Nepal – the central government body for the allocation of funds for education.
	Goal	Quality assurance of engineering education. Set norms and standards for engineering profession. Professional code of conduct. Registration of engineers (name and number for identification).
	Legal backing	Nepal Engineering Council Act, 11 March 1999, promulgated by GON. Clause 37 of the Act foresees in registration of engineers and the provision of licenses.
	Remarks	See list of registered disciplines of NEC below

3	**Society of Consulting and Architect Engineering Firms (SCAEF)**	
	Established	1990
	Registered firms	75 (see website: www.scaef.org.np for updated list).
	Organizational setup	Executive committee of 11 persons, from consultancy firms.
	Goal	To develop the consulting industry in Nepal. Quality assurance. Suggests monthly billing rates.
	Legal backing	Recognized as the National Body for consulting firms on 15 August 1995; looked after by the Ministry of Physical Works and Planning. Public Works Directive, 22 February 2002, stipulated that firms need registration with SCAEF for shortlisting.
	History	It started as a professional society, but now is also a regulatory agency.

Table 4: List of registered engineers per discipline at Nepal Engineering Council

No.	Discipline: Irrigation Related	Male	Female	Total	Female (%)
1	Civil Engineering	5.946	419	6.365	7
2	Agriculture Engineering	135	18	153	12
3	Agri-Irrigation Engineering	22	0	22	0
4	Architecture	349	364	713	51
5	Mechanical Engineering	1.079	19	1.098	2
	Sub-total	**7.531**	**820**	**8.351**	**10**
	Discipline: Non-Irrigation Related				
6	Aeronautical Engineering	98	1	99	1
7	Automation Engineering	4	0	4	0
8	Automobile Engineering	5	0	5	0
9	Bachelor of Urban and Physical Planning	5	0	5	0
10	Bio-Medical Engineering	27	10	37	27
11	Chemical Engineering	46	3	49	6
12	Computer Engineering	1.679	446	2.125	21
13	Electrical and Electronics Engineering	540	65	605	11
14	Electrical Engineering	910	47	957	5
15	Electronics and Communication Engineering	1.992	329	2.321	14
16	Electronics and Telecommunication	36	1	37	3
17	Electronics Engineering	235	21	256	8
18	Environmental Engineering	35	12	47	26
19	Forestry Engineering	7	0	7	0
20	Geology Engineering	19	0	19	0
21	Industrial Electronics	1	0	1	0
22	Industrial Engineering	36	3	39	8
23	Information Technology	165	30	195	15
24	Information and Telecommunication Engineering	8	3	11	27
25	Instrumentation Engineering	0	1	1	100
26	Metallurgical Engineering	6	0	6	0
27	Mining Engineering	35	0	35	0
28	Radio Engineering	15	0	15	0
29	Software Engineering	29	14	43	33
30	Survey Engineering	11	0	11	0
31	System Engineering	25	5	30	17
32	Textile Engineering	12	2	14	14
33	Non-Nepalese Registered	18	0	18	0
	Total	**13.530**	**1.813**	**15.343**	**12**

Annex 20: Overview of engineering associations

The information in this table is based on field research in Nepal (July and August 2011) and on internet search in May 2013. In total, 8 professional associations were investigated through field research – interviews with board members, visits of occasions, reading of publications, and consulting the webpages. These associations are marked with a star (*) near the serial number in the table. In the course of research, when engineers explained to me that they were involved in other associations as well, I learned that there are more professional associations in Nepal than I had assumed. Many of them are located in India or elsewhere abroad, for instance the 'Japan Society of Civil Engineers' in Japan or the 'AIT Alumni Association' in Thailand. For these associations, I have presented basic information based on an internet search. For the overview, I have presented the professional associations in chronological order by year of establishment.

No.	Name	Est.	Members	Membership criteria	Objective	Status & Remarks
1	**Institution of Civil Engineers (India)**	1860	?	BSc degree in Civil or Architectural Engineering; minimum 25 years old.	Lobby organization for civil engineers; protection of professional ethics; facilitation of degree education.	- Very active. - A copy of the British society (ICE). - Take a role in providing degree programmes. - Good website. - Nepalese engineers are member of this organisation.
2	**Japan Society of Civil Engineers**	1914	39.000	Knowledge about civil engineering	Lobby organization; talk programmes; journal publication.	- Active; well organized. - Only a handful Nepalese engineers are member.
3	**Institution of Engineers (India)**	1920 *(1992)*	> 500.000	BSc degree in Engineering. Minimum 40 years.	Lobby organisation for engineers. Talk programmes, training.	- Very active. - Obtained a royal charter from the UK in 1938. - Association IEI members opened in Kathmandu in 1992.
4	**International Water Association**	1947	> 10.000 > 500	Individual. Corporate.	Research, professional organization.	- Very active, based in London. - Merged with another society in 1965 - Only a handful Nepalese engineers are member.
5	**ICID/ Nepal National Committee**	1950	4	Institutional membership, DOI.	Professional organization.	- International Commission for Irrigation and Drainage (ICID) was originally set up in 1950, in India. - Individual membership is possible, but more often though country or institutional membership. - DOI is a member of this organisation, represented through the DG and other high-level officers.

No.	Name	Est.	Members	Membership criteria	Objective	Status & Remarks
6 *	**Nepal Agricultural Association (NAA)**	1960	?	Agricultural graduates; presumably BSc level or more; fee payment.	Unite agricultural knowledge	- Idle after 1970s - Use to publish the first agricultural journal - Can be considered the first professional associations in Nepal. - Initiated by agricultural graduates who had assumed government service in Nepal (after return from abroad).
7 *	**Nepal Engineers' Association (NEA)** [*The Nepalese version of the 'Institution of Civil Engineers' in the UK, est. in 1818*]	1968	> 12.000	BSc degree or higher in Architecture or Engineering. Must be recommended by existing member, fee payment.	Lobby organization; 'Press, Public, Professional and Politician'; talk programmes; charity projects.	- Very active: *The national association for engineers in Nepal*. - Various offices in the country and abroad (Bangkok, Qatar, Japan, Australia). - Plays role in engineering regulation in Nepal, in the Nepal Engineering Council. - Member of World Federation of Engineering Organizations (WFEO). - Co-established the Federation of Engineering Institute of South and Central Asia (FEISCA). - Links with the Institution of (Civil) Engineers (UK, India, Pakistan, Sri Lanka, Bangladesh, Malaysia). - Participated with the World Engineering Congress.
8	**Institution of Public Health Engineers, India (IPHE)**	1972	> 633	Bachelor degree in engineering or more. Individuals and organizations can be member.	Public health and environmental engineering. Talk programmes; trainings, publications.	- Active - 16 country centres in India. - Receive some sponsoring for training of DFID. - Publish technical journals. - Nepalese engineers are member of this organisation.
9	**JICA Alumni Association of Nepal (JAAN)**	1973	959	Ex-participants of the Japan International Cooperation Agency (JICA) in Nepal.	Promote friendship between Nepal and Japan	- Active it seems. - Established by Nepalese trainees and students under academic education under the JICA program. - Changed names in 1982 and 1999.
10	**Indian Water Resources Society (IWRS)**	1980	6.692	Open to any person interested in the water sector, but mostly engineers.	Think-tank; journal publications on technical issues; debate with activist.	- Active it seems. - Linked to IIT Roorkee. - Local centres in Delhi, Pune, Gandhinagar, Nagpur. - They honour respected water resources engineers of Roorkee.

No.	Name	Est.	Members	Membership criteria	Objective	Status & Remarks
11*	**Diploma Engineers Association, Nepal (DEAN)**	1980	25.000	Diploma or certificate level; or 15 months training in TSLC; fee payment; members of Nepal Overseer Association.	Lobby organization for diploma engineering; protecting professional rights; talk programmes; charity projects.	- Very active: *The national association for diploma engineers in Nepal.* - *Can be considered the biggest professional association in Nepal*. - Member of SAARC Diploma Engineers Forum (SDEF). - Member of Mid-level Engineers Forum in Asia and the Pacific Countries (MEFAP).-
12*	**Nepalese Society of Agricultural Engineers (NSAE)**	1990	200	BSc degree is minimum requirement; fee payment	For fraternity of agricultural engineers; consultancy; research; souvenirs.	- Active for a few years, but dormant after 2008. - Links with outside the country. - Mr. Huta Ram Baidya played key role here. - DG (Mahesh Man Shrestha) of the DOI was member of this organisation.
13	**Society of Consulting and Architect Engineering Firms (SCAEF)**	1990	75	Organisational membership – not individual.	Lobby organisation of engineering consultants – very well organized.	- Active, appears well organized. - GON recognized SCAEF as the 'National Body of Consulting Industry' for consulting firms. - Under the Ministry of Physical Planning and Works, following the Public Works Directive of 2002, consultancy firms need to get SCAEF registration for shortlisting. - Linked to International Trade Centre (ITC), WTO - Linked to UN Conference on Trade and Development (UNCTAD) - Linked to UN Economic and Social Commission for Asia and the Pacific (UN ESCAP), and its regional institution Asian and Pacific Centre for Transfer of Technology (APCTT). - Linked to National Institute of Construction Management and Research, India (NICMAR). - Member of Technical Consultancy Development Programme for Asia and the Pacific (TCDPAP). - Member of International Federation of Consulting Engineers (FIDIC), combined in the ASPAC, the regional committee of FIDIC for Asia and the Pacific.

No.	Name	Est.	Members	Membership criteria	Objective	Status & Remarks
14*	**Society of Nepalese Architects (SONA)**	1990	> 563	Bachelor degree in Architecture or more.	Lobby organization for architects; awards; talk programmes.	- Very active, regional conference in KTM in 2013. - Started at Institute of Engineering (IOE). -Member of Architects Regional Council Asia (ARCASIA). - Member of SAARC Architects.
15	**Society of Public Health Engineers Nepal (SOPHEN)**	1990	274	Presumably a bachelor degree in engineering (or public health).	Promote public health issues.	- There are only a eight female engineers registered at SOHPEN (Saciwaters, 2011: 122). - The British SOPHE is old and established it seems. - SOHPEN publishes a journal.
16	**Nepal Geotechnical Society**	1994	?	BSc degree in civil, mining or geotechnical engineering	Professional organization for Nepal and abroad.	- Active - Member of International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), US.
17	**Japanese Universities Alumni Association, Nepal (JUAAN)**	1995	226	Nepalese students who have studied in Nepal; among them civil engineers.	Get-to-gather; talk programme; charity; publications; monthly meetings.	- Active - Member of the South Asian Federation of the Japan Alumni Associations (SAFJAA).
18*	**IIT Roorkee Thomason Alumni Association – Nepal Chapter**	1996	241	Completed BSc, MSc or PhD degree at ITT Roorkee, fee payment	Cultivation Roorkee network; spread engineering knowledge; charity: HIV/AIDS.	- Active between 1996-2004 - Largely idle after 2004, some meetings took place. - Linked to the IIT Roorkee Heritage Foundation in India (Hyderabad Chapter, Lucknow Chapter, North American Chapter, Roorkee Inc. Global Community) - Engineers in government service, NGOs, consultants.
19	**Federation of Contractors' Associations of Nepal (FCAN)**	1997 *(1990)*	253	Company membership	Lobby organization; protect professional rights.	- Started as Contractors' Association Nepal in 1990. - Member of International Federation of Asian and Western Pacific Contractors' Association (IFAWPCA) - Member of SAARC Chamber of Commerce and Industry – Construction Industry Council. - Member of International Chamber of Commerce. - Goal to build-up capacity of construction companies.
20	**Association of British Alumni Nepal (ABAN)**	1997	482	Completed at least a 12 weeks undergraduate course in the UK.	Represent professional interests of British alumni	- Social gatherings. - Institutionalized via the British Council in KTM. - Involved in the promotion of British education. - Irrigation engineers are sometimes member of ABAN.

No.	Name	Est.	Members	Membership criteria	Objective	Status & Remarks
21	**Women professionals in Land Use Sector (WPLUS**	1997	?	Women professionals engaged in the land use sector.	Strengthen and promote the role of women professionals.	- Established at ICIMOD workshop in 1997 for women professionals in agriculture, water and irrigation. - Received support of WINROCK (Saciwaters, 2011:131) - It has a yahoo-group and was active for years.
22*	**International Network for Participatory Irrigation Management/ Nepal (INPIM/N)**	1998	± 200	Professionals, researchers, farmers with an interest in PIM.	To promote and discuss PIM; publications; talk-programmes.	- Active in 1998, then dormant for a while. - Active again in 2008. - Linked to WB-based INPIM network. - Set up in Chitwan District, during a meeting when the National Federation for Irrigation Water User Associations Nepal (NFIWUAN) was also set up. - Membership among DOI engineers was boosted.
23	**Farmer Managed Irrigation System Promotion Trust**	1998	-	-	To promote FMIS knowledge.	- Established with a fund of the Ford Foundation. - It organized five international seminars on irrigation, community irrigation, self-help and the government - The patron is Dr. Prachanda Pradhan
24	**Nepal Water Partnership/ Jalsrot Vikas Sanstha**	1999	131	82 Individual members, and 49 institutional members.	Exchange of knowledge of IWRM, water management.	- National chapter of the Global Water Partnership (GWP), established in 1996. - Delivery-oriented advocacy. - Professional alliance of water professionals. - Engineers, consultants, and politicians are member (but non-partisan).
25	**Women Water Network (WWN)**	2001	-	Organized through NWP/JVS (see no.24)	Strengthen the position of women.	- The WWN is part of the NWP/JVS. - The WWN is outcome of the influence of GWP; active when funding is available (Saciwaters, 2011: 131).
26*	**Nepal Engineers' Wives Society (NEWS)**	2001	500	Wife of engineers who are registered with the Nepal Engineering Council, or a member of the Nepal Engineers Association. 'Lady engineers' can be an 'invitee member'.	Charity foundation; empowerment of women; micro-finance – fund Rs. 100.000; Scholarships for IOE female students.	- Very active. - Publish an annual magazine. - Modelled after the 'Nepal Army Wives Society' and the 'Nepal Police Wives Society' – elite charity foundations. - It is perceived to operate as sister organization of NEA. - Charity includes: health campaigns, blood donations, eye-check-ups, breast cancer campaigns. - Promote 'Teej' and Hindu culture.

No.	Name	Est.	Members	Membership criteria	Objective	Status & Remarks
27	**International Water History Association (IWHA)**	2001	?	Anybody who takes an interest in water studies and history.	Foster historical understanding of water issues.	- Two conferences per year for all its members. - I encountered only one Nepalese engineer who was a member of this organisation. - IWHA is registered in the Netherlands.
28	**Gender, Energy and Water Network, Nepal (GEWNet)**	2002	46	17 individual members; 23 organization members; 6 members status unknown.	To achieve gender sensitive development in the water and energy sector of Nepal.	- Under the NGO/consultancy firm Center for Rural Technology, Nepal (CRT/N). - Part of Energia, an international network on gender and sustainable energy across the globe, hosted by ETC, a non-profit organization in the Netherlands. Its fourth funding phase ended in 2010. - No specific focus on women professionals. - Presumably this network is no longer active.
29	**Structural Engineers' Association Nepal (SEANep)**	2002	> 15	Diploma level engineering or above; mostly BSc. degree engineers it seems.	Promotion of structural engineering t in Nepal.	- Appears active. - Website since 2011, perhaps earlier. - The website mentions a lot of plans.
30*	**Society of Irrigation Engineers Nepal (SIREN)**	2003	200	BSc civil or agricultural eng., with minimum of two years' work experience.	To promote the cause of the irrigation engineers.	- Set up at the occasion of the golden jubilee of the DOI. - Largely idle now, mostly DOI employees. - Organized National Irrigation Seminar 2010 together with DOI, INPIM/N. - Links with NEA and IIT Roorkee.
31	**IOE Alumni Association, Nepal (IOEAA)**	2005	213	Ex-students of the Institute of Engineering (IOE)	Alumni association	- Only a yahoo-group mentioned on google, founded in 2005. - Perhaps this association is older (appears active).
32	**Professional Women for Promotional Activities – Nepal (PWPA-Nepal)**	2007	-	-	Promotion action to make women (water) professionals visible.	- This is not really an association, although it claims to be a network. Part of Nepal Engineering College. - Supported by the regional Crossing Boundaries project of Saciwaters (2011), and Nepal Engineering College. - Active when funding is available (Saciwaters, 2011).
33	**Nepal Engineering Infrastructure Development Society (NEIDS)**	2007	> 200	Engineers and overseers	Focus on education, water, power and infrastructure.	- Appears active. - Has its own main building in KTM.

No.	Name	Est.	Members	Membership criteria	Objective	Status & Remarks
34	**American Society of Nepalese Engineers (ASNEngr)**	2007	> 150	BSc degree in engineering, Nepalese nationality, or friend of Nepal	To encourage debate on technical and scientific issues.	- Active - Registered in the state of South Caroline. - Local chapters in various places in the US. - Good website, facebook etc.
35	**Nepal Civil Engineering Students Society (NCESS)**	2013	-	BSc degree civil engineering at Nepal Engineering College (NEC)	To join civil engineering students of NEC.	- Facebook account mentions that preliminary steps have been taken to set up this society. - Remark: I also have heard that it has existed since 2004 at IOE.
36	**AIT Alumni Association, Nepal Chapter**	-	799	Ex-AIT students – this number includes all Nepalese members.	Alumni association	- Appears active. - Talk about establishing an AIT centre in KTM.
37	**Nepal Overseer Association**	-	-	-	-	- It exists, it is mentioned in various newsletters.
38	**Regional and Urban Planners' Society of Nepal (RUPSON)**	-	-	Nepalese professionals, policy makers and researchers.	-	- LinkedIn profile with 45 members, est. 2011. - Appears *not to be* linked with 'Commonwealth Association of Planners' (CAP) or with 'European Council of Spatial Planners' (ECSP).
39	**Society for Engineers for Rural Development Nepal (SERDEN)**	-	-	-	-	- It exists, it is mentioned in various newsletters.

Annex 21: Facts and figures of the DOI

Table 1: Number of core personnel in the DOI by age and gender

Age group	Male	Female	Total
40 >	122	16	138
41-50	445	2	447
50 <	257	0	257
Total	**824**	**18**	**842**

Source: DOI, 2008 and the Chief Administrative Officer of the DOI, August 2011.
Note: Core personnel is defined by the DOI (2008) as non-gazetted I, and gazetted I, II, III and special.

Table 2: Number of personnel in the DOI by class category and job category

Category	First class gazetted	Second class gazetted	Third class gazetted	First class non-gazetted	Second and third class non-gazetted	Classless	Total	Total (%)
Civil engineering	11	66	217	488	0	0	782	42%
Agricultural engineering	2	13	31	0	0	0	46	3%
Mechanical engineering	0	4	11	31	0	0	46	3%
Geo-Hydrology	2	13	23	20	0	0	58	3%
Architecture	0	0	0	18	2	0	20	1%
Administration	0	2	30	207	3	0	242	13%
Pump & gate operators	0	0	0	0	57	91	148	8%
Social organizers	0	0	0	0	79	0	79	4%
Peon & drivers	0	0	0	0	0	393	393	21%
Miscellaneous	0	2	20	26	0	0	48	3%
Total	**15**	**100**	**332**	**790**	**141**	**484**	**1.862**	
Total (percentage)	1%	5%	18%	42%	8%	26%		

Source: Chief Administrative Officer of the DOI, August 2011.

Table 3: Number of gazetted personnel of the DOI by gender

Class	Male	Female	Total
Third class gazetted	316	16	332
Second class gazetted	98	2	100
First class gazetted	15	0	15
Special class gazetted	0	0	0
Total	**429**	**18**	**447**

Source: Chief Administrative Officer of the DOI, August 2011 and a list of women engineers in the DOI, collected August 2011.

Table 4: Gazetted and non-gazetted first class personnel of the DOI by ethnicity/caste

Class	B/C	Newar	Janajati	Madhesi	Dalit	Total
First class non-gazetted	153	90	Included in category of Newar	235	10	488
Third class gazetted	129	53		84	0	266
Second class gazetted	30	23		21	0	74
First class gazetted	7	6		1	0	14
Special class gazetted	0	0		0	0	0
Total	**319**	**172**		**341**	**10**	**842**
Total (percentage)	38%	20%		41%	1%	
Total (gazetted classes)	**190**	**82**		**106**	**0**	**354**
% (gazetted classes)	54%	23%		30%	0%	

Source: DOI, 2008 (B/C is mentioned as ‘other’ in the original source).
Note: In 2011 (see above), there were 447 gazetted officers (instead of 354).

Table 5: Education level of core personnel in the DOI

Education	First class gazetted	Second class gazetted	Third class gazetted	First class non-gazetted	Total	Total (%)
Higher Secondary Education/ Diploma	0	0	22	461	483	57%
Bachelor	0	5	129	25	159	19%
Master <	14	69	115	2	200	24%
Total	**14**	**74**	**266**	**488**	**842**	

Source: DOI, 2008.

Annex 22: Background details of respondents of the questionnaire

Table 1: Jaat (caste/ethnicity) of respondents

n=36	**B/C**	**Newar**	**Janajati**	**Madhesi**	**Dalit**	**Total**
Men	20	3	1	3	-	27
Women	3	6	-	-	-	9
Total	**23**	**9**	**1**	**3**	**-**	**36**
Percentage	64%	25%	3%	8%	0%	100%

Table 2: Educational background of the respondents (first degree):

<table>
<tr><th>n=36</th><th>Men</th><th>Women</th><th>Total</th><th colspan="2">%</th><th>Percentage of core staff
(DOI, 2008)</th></tr>
<tr><td>BE civil</td><td>11</td><td>6</td><td>17</td><td>47%</td><td rowspan="3">69%</td><td rowspan="3">43%</td></tr>
<tr><td>BE agriculture</td><td>6</td><td>1</td><td>7</td><td>19%</td></tr>
<tr><td>BE mechanical</td><td>1</td><td>-</td><td>1</td><td>3%</td></tr>
<tr><td>Diploma civil</td><td>8</td><td>1</td><td>9</td><td>25%</td><td rowspan="3">31%</td><td rowspan="3">57%</td></tr>
<tr><td>Diploma electrical</td><td>1</td><td>-</td><td>1</td><td>3%</td></tr>
<tr><td>Diploma architecture</td><td>-</td><td>1</td><td>1</td><td>3%</td></tr>
<tr><td>Total</td><td>27</td><td>9</td><td>36</td><td colspan="2">100%</td><td>100%</td></tr>
</table>

Table 3: Subject and places of education of respondents.

Level of education	Subject and place (n=36)
Diploma	• Certificate civil engineering, IOE, Nepal (9x). • Certificate electrical engineering, IOE, Nepal (1x). • Certificate Architecture Engineering, IOE, Nepal (1x).
Bachelor	• BE Civil Engineering, IOE, Nepal (11x). • BE Civil Engineering, Kathmandu Engineering College, Nepal (2x). • BE Civil Engineering, Kantipur Engineering College, Nepal (1x). • BE Civil Engineering, Roorkee, India (3x). • BE Civil Engineering, Regional Inst. of Technology, Jamshedpur, India (1x). • BE Agricultural Engineering, IOE, Nepal (1x). • BE Agricultural Engineering, University of Udaipur, Rajasthan, India (1x). • B. Tech Agricultural Engineering, Punjab Agricultural University, India (3x). • BE Agricultural Engineering, Bangladesh Agricultural Uni., Bangladesh (2x). • BE Mechanical Engineering, Institute of Engineering (TU), Nepal (1x).
Master	• ME Water Resources Engineering, IOE, Nepal (4x). • MSc Natural Resources Management, Pokhara University, Nepal (1x). • MSc Rural Development, TU (1x). • ME Structural Engineering, National Institute of Technology Warangal, India (1x). • ME Irrigation engineering and management , Asian Institute of Technology (AIT), Bangkok (1x). • ME Water Resources Management, University of Luneberg, Germany (1x). • MSc Tech. Irrigation Water Management, Roorkee, India (2x). • MSc Irrigation and water management, Bangladesh Agricultural University, Bangladesh (1x). • MSc Land and water management, Uni. of the Philippines, Los Banos (1x). • MSc. Ehime University, Japan (1x). • MA. Sociology (TU), Nepal (2x).
PhD	• PhD Soil and water management, State university of the Philippines (1x). • PhD. Ehime University, Japan (1x).

Table 4: Membership of engineering associations

n=25	Male engineers (n=17)	Among male engineers %	Female engineers (n=8)	Among female engineers %
NEA	13	76%	4	50%
NEC	4	24%	4	50%
DEAN	6	35%	-	-
SIREN	3	18%	-	-
NSAE	5	29%	2	25%
INPIM/N	3	18%	-	-
ITT Roorkee – alumni association	2	12%	-	-
NEIDS	1	6%	1	13%
Kirtipur Engineering Society	-	-	1	13%
South Asia Diploma Engineers Forum	1	6%	-	-
Consortium for Collaborative Research	1	6%	-	-
Asian Institute of Technology Alumni Association	1	6%	-	-
International Water History Association	1	6%	-	-
American Society for Agriculture and Biological Engineering (ASABE)	1	6%	-	-
Total no. of membership	**42**		**12**	

Table 5: The occupation of your father/ mother

n=26	Male engineers (n=17)		Female engineers (n=9)	
	Father	**Mother**	**Father**	**Mother**
Government employee/ army	4 (24%)	-	2 (22%)	-
Teacher	5 (29%)	-	-	2 (22%)
Business/landlord	4 (24%)	-	1 (11%)	-
Engineer/ overseer	-	1 (6%)	3 (33%)	1 (11%)
Farmer/labour	4 (23%)	2 (12%)	-	-
NGO/typist	-	-	2 (22%)	-
Household	-	14 (82%)	-	6 (67%)
Passed away	-	-	1 (11%)	-

Table 6: Reasons to study engineering

n=25	Male (n=16)	% of n (male)	Female (n=9)	% of n (female)
Interest, fascination or attitude towards science since childhood	6	38%	2	22%
The development of the nation	7	44%	3	33%
Employment, earn money, wealth, status	2	13%	2	22%
Parents' advise	1	6%	-	-
It has specific and practical applications	1	6%	1	11%
The interest to face challenges (related to few women in engineering)/ travelling	-	-	4	44%

Note: Some respondents have given more than one answer; then those answers have been counted separately.

Annex 23: Gender stereotypes among the respondents

Table 1: Gender opinions and stereotypes among the respondents

n=36	Male engineers (n=27)			Female engineers (n=9)		
	Agree	**Dis-agree**	**Neither agree nor disagree**	**Agree**	**Dis-agree**	**Neither agree nor disagree**
The man is the head of the household	(26) 7	(48) 13	(26) 7	(22) 2	(67) 6	(11) 1
All in all, family life suffers when women have a full time job	(19) 5	(59) 16	(22) 6	(11) 1	(67) 6	(22) 2
A job is all right, but what women really want is a home and children	(37) 10	(41) 11	(22) 6	(11) 1	(67) 6	(22) 2
It is better to have a bad marriage than no marriage at all	(37) 10	(48) 13	(15) 4	(56) 5	(33) 3	(11) 1
Being a housewife is just as fulfilling as working for pay	(59) 16	(33) 9	(7) 2	(56) 5	(44) 4	(0) 0
Having a (paid) job is the best way to be an independent person	(66) 18	(30) 8	(4) 1	(89) 8	(0) 0	(11) 1
Both the man and woman should contribute to the household income	(92) 25	(4) 1	(4) 1	(89) 8	(11) 1	(0) 0
High-caste and low-caste people have different duties and obligation in life	(30) 8	(55) 15	(15) 4	(44) 4	(56) 5	(0) 0
A man's job is to get money; a women's job is to look after the home and family	(7) 2	(81) 22	(11) 3	(0) 0	(89) 8	(11) 1
Men ought to spend more time with their children	(44) 12	(37) 10	(19) 5	(45) 4	(33) 3	(22) 2
Watching children grow up is life's greatest joy	(41) 11	(22) 6	(37) 10	(78) 7	(22) 2	(0) 0
Religion should play a central role in people's lives	(26) 7	(52) 14	(22) 6	(11) 1	(56) 5	(33) 3
Paying dowry to the bridegroom's family is a tradition that should be respected	(7) 2	(89) 24	(4) 1	(0) 0	(89) 8	(11) 1
The man knows best about education of the children	(30) 8	(48) 13	(22) 6	(11) 1	(67) 6	(22) 2
Arranged marriage is better than love marriage	(33) 9	(22) 6	(44) 12	(0) 0	(33) 3	(67) 6
The family is incomplete without a son	(7) 2	(78) 21	(15) 4	(11) 1	(78) 7	(11) 1
When there are women, I behave differently than with only men in the group	(48) 13	(37) 10	(15) 4	(45) 4	(33) 3	(22) 2
Women are better than men in maintaining good social relations	(63) 17	(30) 8	(7) 2	(67) 6	(0) 0	(33) 3
Men work more focused and efficient than women	(30) 8	(55) 15	(15) 4	(0) 0	(78) 7	(22) 2
Men make more arguments than women	(48) 13	(45) 12	(7) 2	(22) 2	(45) 4	(33) 3
Women and men have different duties and obligations in live	(45) 12	(48) 13	(7) 2	(0) 0	(89) 8	(11) 1
Women must pursue a professional career	(55) 15	(26) 7	(19) 5	(78) 7	(11) 1	(11) 1
It is important to respect family traditions	(78) 21	(11) 3	(11) 3	(56) 5	(11) 1	(33) 3
Women and men's responsibilities change through time	(100) 27	(0) 0	(0) 0	(100) 9	(0) 0	(0) 0

Note: The number between brackets indicate the percentage.

Table 2: Finish the sentence (on women)

n	Question	Type of answer	% of n
29	Women are happiest in life when...	(1) They have a complete family, husband and children and good health	38%
		(2) They have a job/income and are self-reliant/independent	24%
		(3) They get education/ equal opportunity	17%
22	The most difficult emotion for a woman to display is...	(1) Dominated by husband/ domestic violence/ drunk husband	18%
		(2) Previous love affair, cheating	14%
		(3) About their age, beauty and appearance.	14%
		(4) Family problems/ poverty	14%
24	Women tend to be better than men at..	(1) Emotional attachment, loving and social relations	29%
		(2) Their beauty, outlook and dress	29%
		(3) Looking at children, home, kitchen and family	25%
22	Women get depressed about...	(1) Not having right partner; when men hurt them; when they receive no love and care	36%
		(2) Family problems, scarcity, household burdens, problem with children	36%
		(3) No opportunities for study, jobs; no help family	18%
23	Women are more likely to compete over...	(1) Fashion and beauty	30%
23	Women tend to get angry about...	(1) No equal opportunity, bypassing and overlooking by colleagues, explanation not accepted.	13%
		(2) Cheating	13%
		(3) Needs/ demands unfilled	13%
		(4) Problems and difficulties in the family	13%
24	Women feel pressurized in life when...	(1) Family problems related to no income	21%
		(2) Many works at the same time, household burdens, job demands	17%
		(3) Husband is not in line with her	13%
5	As a woman, I was always taught to...	(1) Be patient, never hurt anyone	60%

Note: Many respondents have answered two things, then that answer has been counted twice.

Table 3: Finish the sentence (on men)

n	Question	Type of answer	% of n
29	Men are happiest in life when...	(1) They have a job, are self-reliant; high social status, successful, rich, prosperous	52%
24	The most difficult emotion for a man to display is...	(1) Sorrow, pains, tears, loneliness, fear, grief.	33%
		(2) His weakness, negative things, mistakes (in front of others).	29%
23	Men tend to be better than women at...	(1) Office, job, profession, outside work.	39%
		(2) Works that require strength, knowledge and analysis	26%
		(3) Decision making/ powerful personality/ leadership/ responsibility	26%
22	Men get depressed about...	(1) Their career, their job, being unsuccessful, their achievements (no promotion, no transfer, no prospects).	45%
24	Men are more likely to compete over...	(1) Social status, power, wealth and income	42%
23	Men tend to get angry about...	(1) Personal matters, when things don't go their way.	26%
		(2) Bossism/ egos/ dominance (at work)	26%
25	Men feel pressurized in life when...	(1) Thing develop beyond their means; when demands & needs remain unfulfilled in the family	52%
19	As a man, I was always taught to...	(1) Safeguard the family environment; look after parents	26%

Note: Many respondents have answered two things, then that answer has been counted twice.

Annex 24: Definitions of engineering

Table 1: Definitions of engineering

Answer (n=20)	**Male (n=14)**	**Female (n=6)**	**Total (n=20)**	**% of n (total)**
• Design and development of infrastructure with a clear concept.	2	1	3	**15%**
• Development as per social need/ applicable for human beings/ solve problems.	3	1	4	**20%**
• The science of applied technology/ technical works/ working with tools.	6	4	10	**50%**
• In depth study, experience and practical knowledge.	1		1	**5%**
• As an engine works, a perfect system, that is safe.	2		2	**10%**
• Increasing efficiency, optimizing resources, cost-efficient, environment friendly.	4	1	5	**25%**
• Engineering is an art, apply mathematics to design buildings and structures.	1	2	3	**15%**
• Development worker.	1		1	**5%**
Total answers	**20**	**9**	**29**	

Note: Many respondents have answered two things, then that answer has been counted twice.

Table 2: Who is entitled to call himself/ herself an engineer?

Answer (n=21)	**Male (n=15)**	**Female (n=6)**	**Total (n=21)**	**% of n (total)**
• Those who graduate engineering courses.	6	3	9	**43%**
• A devoted development worker, responsible for society; committed and hardworking, doing the work ethically within engineering norms and values.	5	1	6	**29%**
• Contributes to or works for engineering development, experienced.	3	1	4	**19%**
• Who can apply scientific and mathematical principles in practice, who has in depth technical knowledge, skill and practical knowledge, and knows about professional activities in the technical field.	6	2	8	**38%**
• To work in a system in a systematic manner, as part of a technical team, guiding others in engineering work.	3		3	**14%**
• Who has an innovative idea.	1		1	**5%**
Total	**24**	**7**	**31**	

Note: Many respondents have answered two things, then that answer has been counted twice.

Table 3: When someone says he/she is an engineer, what does that mean to you?

Answer (n=16)	Male (n=12)	Female (n=4)	Total (n=16)	% of n (total)
• Received an engineering degree; well-known about theoretical matter in engineering and natural resources management; acquired the basic knowledge and skill for solving problem through a scientific approach.	5	1	6	**38%**
• Development or social worker who contributes to nat. dev. Hardworking, proud and devoted for society.	4	2	6	**38%**
• Good knowledge and experience, and practical knowledge, as well as knowledge about work performance.	2	1	3	**19%**
• Person who works in a system (or team) in systematic manner for the society; a friend for sharing problems.	1	1	2	**13%**
• Technical, efficient or effective person.	3		3	**19%**

Note: Many respondents have answered two things, then that answer has been counted twice.

Table 4: What are the characteristics of an engineer?

Answer (n=16)	Male (n=12)	Female (n=4)	Total (n=16)	% of n (total)
• Devoted development or social worker, dutifully and hardworking.	5	3	8	**50%**
• Contributes to the engineering profession	1		1	**6%**
• Well-known about surveys and recent technology, design, accurate estimates and about implementation; knowledge about local situations and needs for applying engineering principles for practice.	5	1	6	**38%**
• Disciplined in system work, perfectness in work and willingness for innovation/ collaborative	2		2	**13%**
• Efficient, economic and energetic; analytical and pragmatic; show competitiveness, willingness, and patience; be honest, innovative, and ready to face challenges; act creative, effective and with diligence; be intelligent and having a soft corner for social values; be a dashing personality that perceives or identifying future problems in a competent way.	6	3	9	**56%**

Note: Many respondents have answered two things, then that answer has been counted twice.

Annex 25: Goals that engineers seek to pursue in their career

Answer (n=20)	Male (n=13)	Female (n=7)	Total (n=20)	% of n (total)
• To establish yourself as a good irrigation engineer; reputation; recognition; satisfaction and feeling proud; become a personality.	3	4	7	**35%**
• Security and payment; education opportunities for children; make the life of children successful.	4	-	4	**20%**
• Irrigation facilitation in the whole country; increase agricultural productivity for Nepal; improve quality of irrigation projects; commercial farming in Nepal.	5	-	5	**25%**
• Get expertise on irrigation for career development; becoming an expert; build capacity learning about new things.	3	4	7	**35%**
• Promotion; complete assigned task.	1	1	2	**10%**
• Corruption reduction.	1	-	1	**5%**
• Research on irrigation; IWRM.	1	-	1	**5%**
• Delivery to stakeholders; meet the demand of farmers for irrigation resources.	2	-	2	**10%**

Annex 26: Tasks, priorities and pleasures in the irrigation sector

Table 1: List of irrigation tasks that respondents could choose from (8 out of 22)

(Upgrading) designs of irrigation systems
Field surveys
Talking with farmers about irrigation and project matters
Official meetings at the office
Maintaining good relationships with colleagues
Taking part in formulating new policy
Exchange of experiences by attending seminars
Negotiating with contractors
Capacity building and integration of female colleagues
Delivering/ finishing a project by the targets of the plan
Working with senior colleagues
Cooperation with other government departments
Capacity building and supervision of younger colleagues
Setting up and cooperate with a Water Users Group
Give leadership to staff
Getting promotion
Receive recognition for your work from colleagues
International consultancies
Switch job position
Travel through Nepal for work
Working with experienced colleagues
Others, namely...

Table 2: What do you consider most pleasurable in your job?

Type of answer (n=19)	Male (n=13)	Female (n=6)	Total (n=19)	% of n (total)
• Development and completion of infrastructure.	3	1	4	**21%**
• Design of new projects/ drawings.	4	2	6	**32%**
• Remain undisputed.	1		1	**5%**
• Satisfaction of the farmers for the job done.	1	1	2	**11%**
• Field work; work in new places, and the interaction during work.	2	2	4	**21%**
• To give water to the barren land.	1		1	**5%**
• Supervision and giving innovative ideas to subordinates.	2	1	3	**16%**
• To work with the marginal people for lifting up their lifestyle, to serve the poorest of the poor; to perform work that has a direct impact on livelihoods of the people (social engineering).	3	1	4	**21%**

Note: Respondents often indicated more than two answers; these have been counted separately.

Annex 27: Performances of success

Table 1: Answers for job (un)satisfaction specified by gender and roadway (n=30)

Roadway	Class	Gender engineers	Happy/ Unhappy	Answers (mostly from male engineers, except the yellow marked)
The high road	Gazetted I	Male	Happy	(1) Satisfied because of my involvement in policy formulation and opportunities for higher studies and persecuting my works in national and international forum (Q1MGI).
			Unhappy	(1) Little unsatisfied because of my ineffectiveness in the implementation of reward and punishment provisions (Q1MGI). (2) Lack of co-ordination among agricultural agencies (Q2MGI). (3) You are often (not) evaluated and placed on the basis of political connections etc (Q2MGI).
	G. II	Male	Happy	(1) Happy about my project serving most deprived people (Q27MGII).
			Unhappy	(2) I could not get opportunities for [personal] capacity build up in time for my employer, e.g. further studies (Q5MGII).
	Gazetted III (junior)	Male	Happy	(1) I am in a position to serve 'our' Nepali community for income generation by supplying efficient water to their fields by constructing canals (Q6MGIII) (2) Happy because I have dealt with issues while working at the DOI which provided me a lot of motivation and recognition (Q23MGIII).
			Unhappy	(1) No skill development programme (Q7MGIII). (2) I am not satisfied about political pressure in the selection of irrigation project and budget distribution (Q24MGIII).
		Female	Happy	(1) I am happy about the nature of work I am doing. I need to experience a lot in this job (Q22FGIII). (2) I can work with high potential people and farmers (Q30FGIII). (3) I am happy that I can travel and teach farmers (Q38FGIII)
			Unhappy	(1) Unhappy about others think and feel that girls cannot go to the field, site and remote places to work (Q28FGIII). (2) I know there are many opportunities and I am not getting it just because I am a female (Q31FGIII). (3) I have family obligations; I cannot stay long in the field (Q38FGIII). (4) I do not like to stay idle; I want to go to the field (Q39FGIII).
The middle road	G. III (promoted)	Male	Happy	(1) Happy, when good infrastructure is developed (Q12MGIII).
			Unhappy	(1) I was not given any chance for promotion though I am working on this post for more than 15 years, as well as 15 years on the previous post (Q8MGIII). (2) Political interference with government employees (Q13MGIII).
	NG. I	Male	Happy	(1) Permanent and secure job (Q10MNGI).
			Unhappy	(1) Low pay and not much work (Q10MNGI).

Table 2: Feeling of security in job by gender and class

Answer (n=34)	Male (n=26)	Female (n=8)	Total (n=34)
Gazetted I (n=4)	7,8	-	7,8
Gazetted II (n=6)	6,3	-	6,3
Gazetted III (n=20)	6,4	6,6	6,5
Non-gazetted I (n=4)	6,0	-	6,0
Total	**6,5**	**6,6**	**6,6**

Note: Marked on a scale of 1 to 10

Table 3: Typical answers for feeling of security (n=28)

<table>
<tr><th>Roadway</th><th>Class</th><th>Gender engineers</th><th>Answers
(not the exact quotes)</th></tr>
<tr><td rowspan="4">The high road</td><td>G. I</td><td>Male</td><td>(1) I am secure till I deliver (Q1MGI).
(2) I have a permanent job, and I can work until I am 58 years old (Q2MGI).
(3) I have already worked in this institution for 25 years and I have a good track record (Q19MGI).</td></tr>
<tr><td>G. II</td><td>Male</td><td>(1) I command my subject matter and dutifully do my job so I feel secure about my job (Q14MGII).
(2) Very secure because I cannot be detached from my job unless or until I make a blunder & mistakes in my profession (Q5MGII).
(3) Although I am a permanent employee, I am not feeling secure due to the unstable situation (political) of the country (Q4MGII).
(4) Secure with pension programme, but also unsecure because it will not be enough to maintain normal life (Q26MGII).</td></tr>
<tr><td rowspan="2">Gazetted III (junior)</td><td>Male</td><td>(1) If we work "ethically", we can feel our job as secure (Q6MGIII).
(2) Since I am working in the government I feel very secure on the job (Q23MGIII).
(3) As an engineer, I have to handle all official paper works. I can rarely find time to visit the site. If there is inferior quality work happening at the site then I know it only after the problem starts up (Q21MGIII).</td></tr>
<tr><td>Female</td><td>(1) I feel secure as I am in government organization (Q22FGIII; Q39FGIII).
(2) I feel secure about the job position but not about the job responsibilities (Q31FGIII).
(3) I feel secure about permanent job, but not about my government (Q34FGIII).</td></tr>
<tr><td rowspan="2">The middle road</td><td>G. III (prom.)</td><td>Male</td><td>(1) Personal security problems in several districts, also I feel insecure due to political interference on government employees (Q13MGIII).
(2) Engineering work is risky (Q36MGIII).</td></tr>
<tr><td>NG. I</td><td>Male</td><td>(1) Fixed employment is good, nobody can do me anything (Q9MNGI).
(2) When constraint increases, I feel insecure (Q16MNGI).</td></tr>
</table>

Table 4: Feelings of successfulness among staff of the DOI (n=32)

Roadway	Class	Gender engineers	Answers (not the exact quotes)
The high road	G. I	Male	(1) Yes, I am satisfied what I did over the years (Q1MGI). (2) Yes. So far I have achieved what most of my colleagues have not been able to do (Q2MGI). (3) Yes, because I have been well recognized by both farmers and fellow colleagues (Q19MGI).
	G. II	Male	(1) Yes. I tried my best to complete the assignments given to me (Q4MGII). (2) Yes, I may solve most of the problems coming (to) this seat (Q5MGII). (3) No, after 20 years in job I have just been promoted to 2nd class officer (Q3MGII). (4) No real role in policy making (Q26MGII).
	Gazetted III (junior)	Male	(1) Yes because: Although it has been short time in this department I have learnt a lot and have given a lot to this department. I see my great future ahead as successful person in this department (Q23MGIII). (2) No, I am a new comer, so I can't say I am successful, but it also does not mean that I am unsuccessful (Q6MGIII). (3) No, job just started; not a period of evaluation (Q7MGIII).
		Female	(1) Yes, because: as I am getting what I have planned for (Q30FGIII). (2) No, because: I am just a beginner. It takes a long way to go (Q31FGIII). (3) Not yet because many things are yet to be learned/known in my case (Q22FGIII). (4) No, because I have not been able to use my full potential (Q39FGIII).
The middle road	G. III (prom.)	Male	(1) Yes, because I have a long experience on irrigation engineering and working with communities (Q12MGIII; Q36MGIII; Q37MGIII). (2) No. My thinking is: people must work for food. They should produce at least sufficient for their own local community. I could not convince the farmers (mainly the leading ones) as I liked (Q8MGIII).
	NG. I	Male	(1) Yes, I am satisfied in my job (Q10MNGI). (2) Yes, irrigation is good for the farmers, and they can grow rice (Q9MNGI).

Annex 28: Roadways in the DOI

Table 1: What steps are necessary to get promotion (n=21)

What is necessary to make promotion for a...				
Age	**Activities**	**Attitude**	**Knowledge and skills**	**Other characteristics**
Junior engineer	(1) Those who can write in open examination will get promotion [and] if he also succeed in interview (Q13MGIII; Q39FGIII) (2) 5 years' experience in the related field (Q12MGIII). (3) Execute the job given by [the] boss efficiently within a deadline (Q26MGII). (4) Consistently good work [in the] field (Q29FGIII).	(1) Good behaviour, professional ethics and morality (Q12MGIII). (2) Dedication (Q27MGII). (3) Obedient and talented (Q19MGI) (4) Honest, disciplined, and confident (Q16MNGI). (5) Hard working (Q14MGIII). (6) Responsible and bold in decision making (Q22FGIII).	(1) Technical knowledge, administrative knowledge, managerial knowledge (Q13MGIII). (2) Book knowledge [and] field knowledge (Q32FGIII).	(1) Higher [education] qualification and better work performance (Q23MGIII). (2) Opportunities for education and training (Q36MGIII). (3) To be close with secretary and DG of Ministry of Irrigation, Nepal (Q20MGIII).
Middle-aged engineer	(1) Planning and policy making at field level (Q29FGIII). (2) [Practice a] level of co-ordination in job regarding different issues [and] problems (Q21MGIII). (3) Formulation of plan and strategy (Q18MGI). (4) More interaction [with people] (Q30FGIII). (5) Seminars [participation] (Q32FGIII).	(1) Efficient and capable (Q12MGIII). (2) Decision making ability (Q27MGII) (2) 1. Patience; 2. Innovative; 3. Clear vision with clear concept (Q26MGII). (2) Responsible and diligent (Q22FGIII).	(1) Good management and technical knowledge (Q14MGII). (2) Field knowledge (Q32FGIII). (3) Can deal [with] social problems [in the field] (Q22FGIII). (4) Knowledge sharing skills (Q18MGI).	(1) Trained regularly to know about new technology (Q36MGIII). (2) close relation with [the] boss (Q20MGIII).
Senior engineer	(1) Planning and designing of structures of DOI (Q21MGIII). (2) Formulation of development and management plans (Q18MGI) (3) Reach to political power to get promotion (Q13MGIII).	(1) Clear vision and leading capacity (Q12MGIII). (2) Reserved (Q14MGII). (3) Good faith and trust (Q23MGIII). (4) 1.Confident; 2.Technically sound; 3.Facilitator (Q26MGII). (5) Prompt in his actions in a smart way (Q30FGIII).	(1) Good organization skill (Q14MGII). (2) Analytical capability and decision making ability (Q27MGII). (3) Monitoring and evaluation skills (Q18MGI).	(1) Great level of work competency (Q23MGIII). (2) Political support (Q32FGIII). (3) Nepotism, favouritism and money is basic criteria to get promotion (Q20MGIII).

Table 2: The activities that are considered necessary for becoming successfulness (n=21)

<table>
<tr><th>Roadway</th><th>Class</th><th>Gender engineers</th><th>Answers
(not the exact quotes)</th></tr>
<tr><td rowspan="4">The high road</td><td>G. I</td><td>Male</td><td>(1) Work experiences and realization (Q18MGI).
(2) Recognition from others (Q19MGI).</td></tr>
<tr><td>G. II</td><td>Male</td><td>(1) Command in subject matter, hardworking, should know importance of time, friendly behaviour (Q14MGII).
(2) 1. working environment should be friendly; 2. should be free from minor tension; 3. time based promotion (Q26MGII).</td></tr>
<tr><td rowspan="2">Gazetted III (junior)</td><td>Male</td><td>(1) To be successful one has to be honest, diligent, and must have learning attitude (Q23MGIII).
(2) Sincere towards work (Q24MGIII).</td></tr>
<tr><td>Female</td><td>(1) 1. Patience, 2. Opportunity (Q31FGIII).
(2) Hard work, need to be courageous (Q30FGIII).
(3) Construction and running several irrigation systems successfully (Q29FGIII).
(4) Field work (Q38FGIII)
(5) Support from family and friends (Q39FGIII)</td></tr>
<tr><td rowspan="2">The middle road</td><td>G. III (prom.)</td><td>Male</td><td>(1) Good team work (Q13MGIII).
(2) Have good technical knowledge, community skills, successful to construct a very good structure (Q12MGIII).
(3) My own labour and my role as a senior officer (Q36MGIII).</td></tr>
<tr><td>NG. I</td><td>Male</td><td>(1) Having in-depth knowledge on related subject, technical knowledge, application of the knowledge in the field (Q16MNGI).</td></tr>
</table>

Table 3: Achievements that make engineers proud (n=16)

Age	Presently	Future	Success story shared with colleagues
Junior engineers	(1) Successful implementation of designed project (Q23MGIII; Q24MGIII; Q35MGIII; Q38FGIII; Q39FGIII). (2) Recognition [among colleagues] (Q31FGIII).	(1) Promotion and attending international seminar (Q23MGIII). (2) To become DG of the DOI (Q21MGIII; Q22FGIII).	(1) Got admission at IOE, Pulchowk campus (Q22FGIII). (2) Completion of project successfully during conflict situation with my initiation (Q21MGIII). (3) Completion of project given by my senior, working with locals day in day out to make it happen (Q39FGIII).
Middle-aged engineers	(1) I have equal knowledge on survey, design, estimate and implementation (Q13MGIII). (2) Working in remote part of the country (Q27MGII).	(1) To be a manager or a leader (Q12MGIII).	(1) Success story of Integrated Crop Water Management Project (ICWMP) in relation to women leading package (Q26MGII).
Senior engineers	(1) Recognition from targeted group (farmers) (Q19MGI). (2) Working and doing activities with the community (Q37MGIII). (2) The progresses and result gained in my career for targeted group (Q18MGI).	-	(1) Number of sharable success stories about projects which had efficient support of target groups (Q18MGI). (2) Certification by the WUA of Naubise Phant Irrigation System and solution to the desilting problem in Begnas Irrigation System (Q19MGI).

Annex 29: Programme of the workshop with female officers and engineers in the DOI

Title: Working culture and women in the DOI, 5 August 2011.
Purpose/goal of the event: To get insight in the working culture at the DOI and to understand the constraints and challenges that women at the DOI face in their working career.
Aims: (1) To understand the career path of women engineers and their 'ideal' career path; (2) To collect information on the obstacles for women; (3) To jointly describe the working culture at DOI and the behaviours that suit such a culture; (4) To jointly define a definition of 'masculinities'.

Time	Lead	Input	Purpose/ method
5	Riti/Jw	Introduction. Briefly explaining the agenda and introducing facilitator, researcher, note taker. Ask permission for recording	Warm up, get introduced, have everyone speak once.
15	Riti	Draw your timelines: (1) Your timeline after SLC school time till now. What were major events; (2) The time line of an ideal career path for an engineer; (3) What would be an ideal career path for yourself? - make symbols and place words to signify important moments- - please write your name and position on the sheet-	Understand the ideal career path and the reality: women's career path.
20	Riti	How does the ideal career path differ from your own career path? Plenary: (1) Mention some of the differences; (2) Address those differences that are related to gender; (3) Can these differences be overcome? Why/why not?	Identify gender issues in the career path of women engineers. Understand reasons for not achieving ideal career path
20	Riti	Brainstorm: in pairs of two, come up with at least 5 professional obstacles in the career path of a woman engineer. Use meta-cards and tape to put on board/wall	Identifying obstacles
10	Break	Group the cards/obstacles	Categorising
15	Riti	Joint analysis of the categories: What is related to a working culture?	Identifying features of working culture
15	Riti	Jointly describe the working culture starting from these features. What are behavioural issues that go together with this working culture. Examples?	
20	Riti	If we call this working culture 'masculine', what would be your definition of masculine working culture for DOI?.	Use 1 card for personal definition. Then, share with 1 other person and merge into 1 definition. Share all to get definition.
10	Riti	Ask for feedback and experiences: (1) What was it like to meet as women engineer for DOI? (2) What have you learned this afternoon about your colleagues? (3)What would you like to take with you for the future?	
5	Jw	Closing, explain what will happen with data, Give contact details.	

Annex 30: Awareness of engineers about gender in the DOI

Table 1: Estimations of respondents about the gender of staff at work

Answer (n = 35)	Male (n = 27)	Female (n = 8)	Total (n = 35)
Men	88%	89%	88%
Women	12%	11%	12%

Table 2: Working with a female engineer in the DOI

Answer (n = 23)	Male (n = 15)		Female (n = 8)		Total (n = 23)	
	Yes	No	Yes	No	Yes	No
Worked with a female engineer	80%	20%	75%	25%	78%	22%
Worked with a senior female engineer	27%	73%	38%	62%	30%	70%

Table 3: Agree or disagree

n = 36	Male engineers (n = 27)			Female engineers (n = 9)		
	Agree	Dis-agree	Neither agree nor disagree	Agree	Dis-agree	Neither agree nor disagree
There are too many civil engineers in irrigation	(59) 16	(30) 8	(11) 3	(67) 6	(11) 1	(22) 2
Male domination in irrigation is a problem	(33) 9	(48) 13	(19) 5	(67) 6	(22) 2	(11) 1
The irrigation sector is high-caste dominated	(33) 9	(56) 15	(11) 3	(11) 1	(67) 6	(22) 2
My behaviour with women colleagues is different than with male colleagues	(26) 7	(63) 17	(11) 3	(56) 5	(44) 4	(0) 0
Women must become more involved in irrigation	(70) 19	(19) 5	(11) 3	(100) 9	(0) 0	(0) 0
More women water professionals is a good thing	(78) 21	(11) 3	(11) 3	(100) 9	(0) 0	(0) 0
The irrigation sector is becoming more women friendly	(59) 16	(11) 3	(30) 8	(67) 6	(0) 0	(33) 3
The quota system for women in WUA is good	(81) 22	(15) 4	(4) 1	(89) 8	(0) 0	(11) 1
Gender is mainly a donor inspired concern	(37) 10	(33) 9	(30) 8	(56) 5	(22) 2	(22) 2
The irrigation sector is male dominated	(85) 23	(15) 4	(0) 0	(78) 7	(11) 1	(11) 1
Women can be very good irrigation engineers	(74) 20	(11) 3	(15) 4	(100) 9	(0) 0	(0) 0
There is a need for more social workers in irrigation	(74) 20	(7) 2	(19) 5	(78) 7	(0) 0	(22) 2
Men are better irrigation engineers than women	(19) 5	(55) 15	(26) 7	(0) 0	(67) 6	(33) 3
Irrigation engineers priority is water use efficiency	(78) 21	(7) 2	(15) 4	(78) 7	(11) 1	(11) 1
Equity in irrigation governance will come with time	(85) 23	(11) 3	(4) 1	(78) 7	(0) 0	(22) 2
There is no women discrimination in irrigation sector	(41) 11	(26) 7	(33) 9	(22) 2	(67) 6	(11) 1
Expansion of irrigated area is an important concern	(85) 23	(0) 0	(15) 4	(89) 8	(0) 0	(11) 1
High-caste domination in irrigation is a problem	(26) 7	(55) 15	(19) 5	(33) 3	(22) 2	(45) 4
Women change the professional irrigation culture	(44) 12	(15) 4	(41) 11	(56) 5	(11) 1	(33) 3
Positive discrimination towards women is good	(52) 14	(30) 8	(18) 5	(33) 3	(22) 2	(45) 4
I am in favour of formal gender equity	(89) 24	(0) 0	(11) 3	(100) 9	(0) 0	(0) 0

Note: The number between brackets indicate the percentage.

Annex 31: Awareness of engineers about gender in the field

Table 1: Typical (or possible) women and men responsibilities in irrigation

n = 31	**Total engineers (n = 36)**		
	Male	**Female**	**Both**
Land ownership	(6) 2	(0) 0	(94) 34
Rice cultivation	(3) 1	(11) 4	(86) 31
Canal (kulo) construction	(50) 18	(0) 0	(50) 18
Canal (kulo) maintenance	(22) 8	(6) 2	(72) 26
Emergence repair of canal (kulo)	(42) 15	(0) 0	(58) 21
Control and check water flow in canal	(42) 15	(3) 1	(55) 20
Control and check of irrigation turns	(39) 14	(6) 2	(55) 20
Preparation of field for irrigation	(25) 9	(3) 1	(72) 26
Irrigating the field	(8) 3	(8) 3	(84) 30
Irrigation fee collection	(17) 6	(17) 6	(66) 24
Stealing irrigation water	(33) 12	(3) 1	(64) 23
Giving fine to irrigation violators	(17) 6	(14) 5	(69) 25
Collecting fine of irrigation violators	(17) 6	(22) 8	(61) 22
Going to irrigation meetings	(6) 2	(3) 1	(91) 33
Speaking at irrigation meetings	(6) 2	(3) 1	(91) 33
Administration of irrigation affairs	(14) 5	(3) 1	(83) 30
Using water for other purposes	(3) 1	(28) 10	(69) 25
Making conflict on irrigation water	(28) 10	(6) 2	(66) 24
Solving conflict on irrigation water	(8) 3	(6) 2	(86) 31
Act as project beneficiary	(3) 1	(3) 1	(94) 34
Travel to irrigation office	(25) 9	(3) 1	(72) 26

Note: The number between the brackets indicate the percentage.

Table 2: Estimated female and male headed households in Nepal (percentage)

Answer (n = 30)	**Male (n = 26)**	**Female (n = 4)**	**Total (n = 30)**
Male headed households	84%	79%	83%
Female headed households	16%	21%	17%

Table 3: Perceived obstacles for more gender equity in irrigation

Level	**Score (n = 27)**
Norms and values in society	2,3 (1)
Male users in irrigation systems	4,3 (2)
Economic inequity	4,4 (3)
Gender roles in irrigation	4,6 (4)
Professionals (and their perceptions)	5,1 (5)
Irrigation sector (and the professional culture)	5,6 (6)
Conflicting policy objectives	5,8 (7)
Female users in irrigation systems	6,6 (8)
Changing donor interests	7,6 (9)
Others: Nothing mentioned	-

Note: Not all respondents followed the ranking neatly. All values have been added in sum and divided by n. The number between the brackets indicate the rank number.

Annex 32: The silent treat and mental violence at home

Introduction: There is a discussion about married women going to the field for work. An elderly participant explained her personal struggles within her family to go to the field after child-birth, and claimed that times have changed. She argued that it is now easier for women engineers to participate in field trips. This section of the conversation starts with the facilitator cross-checking this claim with younger participants, who readily contested the argument of the elderly participant, and argued instead that things have remained the same.

Facilitator: (...) "*Do things have changed in that sense?* (...) *Do you recognize this?* (...) *Do you feel you can more likely go to the field? I don't know how many of you are married or unmarried;* (...) *do you feel you can go more easily go to the field* (...)?"

Participant A: "(...) *after marriage, it will be difficult to go to the field*".

Facilitator: *"*(...) *What do people tell you when they say* (...) *you cannot* [or] *should not go* [to the field], *what* [are] *the arguments that they give?"*

Participant B: "*They don't really give arguments* (...) [like], *you cannot go to the field, but silently they are speaking. They are speaking silently that we cannot go to the field. And that is the major problem. They cannot* [tell] *us that we cannot go to the field*, [or] *we cannot do this, we cannot do that. If they speak out*, (...) *we could conquer their feelings, we could* (...) *be sure what they are saying, but they* ***don't*** *speak out; it is our major problem, they are just speaking it silently* (...)".

Facilitator: *" Like disapproving?".*

Participant B: "*Yes*".

Facilitator: *" Silently?"*

Participant B: "*Yes*".

Facilitator: "(...) *That is the worst no? When your mom doesn't look at you, and she goes like...tst, tst, tst...*(...); *no words is the hardest*".

Participant C: "*It is a big mental violence* (...)".

Facilitator: "*Yes (...), mental violence, ooh, so people ignore you* (...)".

Participant B: "*Ladies are supported by the family, but after getting married,* (...) *in-laws don't really support* [us], *they cannot just argue and say 'you cannot go', because I am an engineer, they cannot not force me to stay* [at] *home, but they are silently speaking that 'Oh my God, do you have to go' or something like that* (...)".

Source: Tape 1: 48:08 to 49:38 (emphasis original).

Annex 33: Gender biases at the entrance gate of the DOI headquarters

Introduction: An elderly participant explains her experiences of gender biases at the ground of the DOI regarding guards who salute government staff, and the use of cars and bikes.

Participant C: "*One word* (...). *Even the guard of* [the] *ground sitting at the gate salute* [only] *men, not women*"

Other participants: [A lot of laughing in response to this story]

Facilitator: "*No!?*"

Participant C: *"Yeah!*"

Participant D: "(...) *They salute me"*.

Other participants: [A lot of laughing in response to this story]

(...).

Facilitator: "[He] *salute you?"*

Participant C: "*Hoina*, they salute those who drive by bike and car*..."

Facilitator: "*The bike and the car people, ha ha ha! That is the difference* (...)".

(...).

Participant C: "[It is a] *gender bias; hakim* [jaane] *matra, hoina?** The car is* [from] *everybody. The car* (...) *use* [also] *is* [showing a] *gender bias*".

Other participants: [A lot of laughing in response to this story]

Facilitator: "(...) *Of course*".

*"hoina" means "no".
** "hakim jaane matra, hoina?" means "the boss goes alone, is it not?"

Source: Tape 2: 53:10-54:30

Annex 34: Sexual harassment and offensive talk by male engineers

Introduction: Women explained about incidences of sexual harassment and offensive talk in the informal milieu of the DOI.

Participant G: "*I also noticed one thing. There are some of our seniors that would say 'yes women should come forward'* (...), *but when they say that it is not always in a professional level. It is something else. That is also what I felt somewhere, I heard my colleagues talk about* [sexual harassment], [because] *we just chat about everything, and they say 'that is why he wants ladies engineer to be there, so better not got there', you know, stuff like that,* (...) *it's* (...) *really, really* (...) *that really happened, that stuff* (...)".

Facilitator: *"Well, believe me, sexual harassment in the work floor is everywhere in the whole world, it happens, so* (...) *I am not surprised if that is* (...) *the intend* (...). *Some people say 'no, not here, not here'; believe me, it is everywhere*".

Participant C: "*Yeah*".

Participant G: "*Yes, it is everywhere".*

Participant D: "*Sexual harassment is not just the physical sexual harassment, you know;* [it is also] *the way they see you, the way they talk with you, and* [male colleagues] *are free to talk with us* (...). *There should be sometimes limitations for that, you know, if we keep our distance, then ...; okay, if we are* [behaving] *free, okay, if we do whatever we want, than that is different; but we keep our distance, if I respect someone, than he should respect me!"*

Facilitator: "*Yes, absolutely* (...)".

Participant D: "*And, you cannot say like, okay* (...) *he did* (...) *that to me, you cannot say* [that] *to everyone, you know, we are not in habit of talking with everyone about what he did to me or what he said to me* (...)".

Facilitator: "*Because you get a bad name* (...)?"

Participant D: "*Yeah,* [on] *both front* [i.e. no habit of talking about sexual harassments, and it will look bad on the girl/woman]. *I talk with* [my male agricultural engineering] *colleagues,* [and I hear them say that] *'I say this to this girl, and she is so and so, and so and so* (...)'. *Sometimes,* [I feel] *like slapping them* (...), *you know*".

Participant H: "*Some* [men], *they just want to talk with me about such things* (...)".

Participant D: "*Yeah,* (...) *when we enter in our supervisors room or somebodies room, if there three, four people, we first see who are there in the room, to know what they talking about, and if they start* [the meeting], *we talk for one hour about* (...) *office things, and they start another stuff, then, let's walk away from there, you know, then* (...) *the chat definitely is* [going] *to different orientations. So, it is better not to go in such things".*

Participant H: *"Some people they are like that, even engineers, there was one engineer where I worked [in the] past, he would me once to focus on such things, and* (...) *some about women, like* [he did] *such things on me* (...)".

Facilitator: *"Yeah, but also you miss out on comradeship, right? Because, it is like with a lot of people gossiping, or saying about sexual jokes, or stuff like that?"*

Participant H: "[My case was] *not like that;* [it was much more serious], *but there are few* [men] *who are* [only] *like that. They just want to talk about the girl, and about the dresses, about this and that* (...)".

Participant D: "*How* [girls] *are looking today? What are* [girls] *wearing today?*

Other Participants: [Laughing in response to this story].

(...).

Participant D: "(...) *sometimes* [sexual harassment] *is direct, sometimes it is indirect".*

Participant H: "*You just like to slap them in front of* [other men], *but that also we cannot do,* (...) *that is our problem* (...)".

Source: Tape 1:1:03:25-1:07:00

Annex 35: Background on toilet visits in Nepal

Women engineers explained in the meeting that proper toilets are a concern for them when they go on field trips. They explained that women generally need toilets to meet certain standards. For cultural reasons – not biology – high caste women need a good bathroom, particularly the facility of water to clean up evidence of menstruation. These sensitive issues could hardly be discussed in a group meeting in a time frame of less than two hours. Therefore, I have consulted a medical anthropologist in Nepal, Mr. M. Subedi, to explain me about the intricacies of toilet visits in the field, and clarify these dimensions of 'women's security' for me. He wrote to me:

- It is said, very commonly, that men can urinate outside ('open urination'), even if somebody sees him, although women are not supposed to see it (see photo below).
- In contrast, the genitals of a woman, particularly the vagina, are the most secret parts of the body, and the husband is the only person who has right to see it. In case there is a temporary toilet ('khalde charpi'), women may feel that her body is exposed or seen by others, which is regarded as inappropriate. Hence, the issue of toilet visits and the exposure of secret body parts are directly related to each other.
- Generally, using the same toilet during menstruation is not a problem, but it becomes shameful for women if there are blood spots seen in and around the toilet, and there is no water to clean it.
- In addition, if a daughter, sister or wife is sexually harassed by another person or group, this becomes an issue of family reputation. In such cases, the blame goes to male members of the household (e.g. father, brother, husbands) in such a way that they could not protect their women.

Source: Photo of Mr. M. Subedi

Annex 36: Male officers' reluctance to work with women in the field

Introduction: Participants explained that women are not supported in their professional career at home, and one participant continued by saying that the situation is similar for women at the office. The conversation here is particularly about the reluctance of male engineers to work with women engineers in the field.

Participant B: "*And this doesn't only matter at home, because it matters as office as well*; *our seniors, male seniors, officers,* (...) *they are not readily allowing us to go with them, and they think that* (...) *taking* [a] *lady in the teams, in the field will create some kind of problem,* (...), *and they don't want to face it at all.* (...) *It is not an issue* (...), *it is just their thinking* (...). *Right now, two or three ladies are* (...) *in the field, and, what I heard from a* [male] *senior* [is] *that* (...) *some senior officers* [do] *not want any lady engineer* [or] *lady employee at their office on their risk.*

Facilitator: "(...) *the office in the field, you mean?"*

Participant B: "*Yes, yes*"

Facilitator: "*So, in the field* (...) *they don't accept it when you come?"*

Participant B: "*Yeah, they don't* (...) *like* [us] *as they accept boys*". (...)

Participant B: "*Because, they think themselves* (...) *to be responsible for a lady*. (...) *in fact* [when] *getting a* (...) *male engineer in their office, they don't feel* (...) *responsible for their deeds,* [and] *they don't have to be responsible for the male engineers or the male staff. But in case of female staff,* (...) *they are compelled to feel responsible and they don't want it*".

Facilitator: "(...) *Do you know what* [male officers] *are* (...) *afraid of*?

Participant D: "*Yeah* (...) *there might be two reasons for behaving like that. One is security of a girl. Security* [of women] *is always a first concern for everybody* [in the household]. *If* (...) *a lady is living in a house, than it is a concern of everybody,* [or] *in an office,* [or] *field office. And most of* [the offices] *are not nearby* (...) *the district headquarters;* [most] *project offices are in the remote areas. First is security. The second option is* [that] *we do not sit with men and talk with them freely about everything; men to men talking is easier, like women to women talking, so* [without women] *it is easy* [for men] *to deal with* [their work]".

Facilitator: *"So, maybe it is threatening* [for men], *so they cannot be the same way as they are with friends, or just hanging* [around], *or drinking, or whatever, eating chicken?"*

Participant D: "*Yeah*".

Source: Tape 1: 49:38-53:11

Annex 37: Being treated as a second option

Introduction: Talking about field visits and about challenges women encounter to participate in field visits, a participant explained that women are treated as a 'second option'.

Participant G: "(...) *What I noticed when I used to work before in an NGO, I was alone, so I* (...) *would do everything, I could do everything, everything was left* (...) *to me; it was okay* (...), *but when I came here,* (...) *I always become like a second option. If the men don't want to go, if the men have some problem, then; 'do you want to?' or 'is it okay, if I send someone else?'.* [Working with women] *is always like a second choice for them. And, even if I go* (...), *they scratch their head, and they say 'okay, if you are going, then we have to change the whole* [plan]*'.* (...) *it's a whole new arrangement for them* [and] *they have this headache if they have to take a lady with them. And, the second thing is,* (...) *recently, I asked some of my seniors, if they want some new engineers in their department* (...); [and they explained to me] *if you have a male subordinate, it is easy for us, because we can call them anytime we want, seven o'clock in the morning, twelve o'clock at* [the] *night, and we say 'come to the office in the morning, we have got to work'* [and men] *can accept to come where ever, whenever; we can work, if we have to go to field, just come on, pack your bags, and we move, it's okay, but if it is a lady, we cannot say that, we have to think 'Oh God', we cannot go* (...) *where we want".*

Source: Tape 1:1:01:25-1:02:45

Annex 38: Gossip among male engineers about female engineers

Introduction: The talk in this textbox was about why men are reluctant to work with women professionals in the field.

Participant G: "(...) *And, the thing is,* [for men, working with women] *is* (...) *also about gossiping going on; if you take the same lady* (...), *even if it is a subordinate, if you take her to places with you, gossiping is going to be huge, and it is going to affect both of them, and that is what* [male colleagues] *are more scared of, I think.*

Facilitator: *"Right, so, for example, you* (...) *develop a good* (...) *working relationship with your male colleague, and you like to cooperate, and he says okay, I like to work with you, let's go every time together, then you start* (...) *gossip?"*

Participant G: "(...) *And, the man would be effected less, and the woman would be effected more, and the thing is* (...), *you know, the effect, psychologically,* (...) *is on much greater level, which usually, I ignore, but it still happens"*.

Source: Tape 1: 1:02:45-1:03:25

Annex 39: Experiences of female engineers with male colleague behaviour

Introduction: The discussion was about behaviour of male engineers at work, and how that affects female engineers. The conversation starts with the facilitator asking to explain situations of male behaviour which women had experienced. In the stories that follow, various perspectives on prevailing gender practices and norms are visible (see point 1 to 4 above).

Facilitator: "[About] *the behavioural part. Can you explain a little bit what that means?* (...) *if you say it is talking* [among men]*; we think we cannot talk with* [men], *or sit with* [men]*, what does that mean?"*

Participant B: *"Okay, I have one example. Being a woman, I like to go to field, and since my childhood I always wanted to go to the remote areas. Physically,* (...) *female cannot be* (...) *compared with the male, but* (...) *the will is the great thing. Once, I got a chance to visit Sanga, and I had to be there in* [the] *office quarter* (...)".

Facilitator: "(...) *Sorry,* (...) *where is Sanga* (...)?"

Participant B: "*It is near Pokhara*".

Facilitator: *"Yes* (...)".

Participant B: *"I stayed there for almost four days, and* (...) *there were all male engineers and male staff.* [In the] *evening we had* (...) *dinner together, and after dinner, they sat for gossip,* [and for] *some kind of job related things.* (...) *I was eager to hear what they say, what they speak*, [because] *I am new to my field. I want to explore more, listening to them as well, listening also matters a lot. And I wanted to sit before them, I want to hear* (...) *their conversation* [and] *I want to add my opinion, but* (...) *the chief of that office wanted me to go out and have my sleep in* [the] *next room. Every time he was saying that, I was arguing 'no sir, it is okay for me, I can handle this'.* (...) *I don't know why he* [said] *that,* [because] *some gents engineers were saying it is okay if she stays here, but he was continuously arguing me to go out.* (...) *I don't know why, and from* [the] *second day,* (....) *he was feeling kind of ashamed. And* [the] *second day, I told* [him] *that, being with male engineers, I had to feel a bit awkward,* [but] *I did not,* [meaning] *that* (...) *I am okay with the situation, but he was not ready to accept it.*"

Participant D: *"*(...) *If you are there, then* [men are] *not free to talk in whatever reason, whatever comes in their language* (...)".

Participant B: "[Men] *have to mind their language and that is* [the] *main thing".*

(...).

Participant E: "[Men have to] *mind their language (...), they have to control their behaviour,* (....) *their drinking* [behaviour]".

Facilitator: *"Oh,* [men have to] *control* (...) *the drinking behaviour? They would drink less in front of you?"*

Participant F: "*Yes,* [men] *will speak whatever they want to,* [but with women] *they* [have to] *control their speech.* (...). *They* [also] *have to control their drinking and their smoking,* [and also] *their dirty talk and everything,* (...) *the whole environment, so* [men] *feel very awkward* [with women].

(...).

Participant C: "*They try to be good in front of ladies*".

(...).

Participant D: *"We just organized one workshop in Nagarkot, this is a national level workshop. And, we view* [male colleagues' behaviour] *over there.* [There were a] *few seniors* (...); *me and another lady* (...) *went over there, and men were drinking. It is not* (...) *that we cannot drink. I don't drink, and few of* [the men] *don't drink, and if they drink* (...) *that is fine, but we were so shocked by the behaviour of some of our very senior supervisors, very good supervisors that we were thinking no* (...)! *Everybody was dancing!"*

Various participants: [Laughing in response to this story].

Participant D: "[Mr.](...), *you know? He was dancing for three and half hours,* (...) *continuously dancing!"*

Participant C: "*No!?"*

Various Participants: [Laughing in response to this story].

(...)

Facilitator: "*And, do you disapprove of that kind of behaviour?(...)"*

Participant D: "*We are okay with it* (...) *yeah..."*

Facilitator: "*Up to some level?"*

Participant D: "*Yeah*".

Source: Tape 1: 55:45-59:52

Annex 40: Career path of women and the double plateau

Introduction: The facilitator asked the participants to describe differences between an ideal career path and their own career path. The conversations in this textbox clearly reveal the double break in career of women professionals.

Facilitator: "*The question is* (...) *how does your ideal career path differ from your own career path* (...)?"

Participant D: "*Yes, it is different in my case* (...). *Being an engineer, after doing my graduation and after joining office, I am supposed to go to the field office, and develop my* [experience] *in the field, but now I am married and I have a child; so I am, in a way, compelled by social* [norms]*; I cannot go, I cannot travel* (...).

Other Participant: [Laugher in response].

Participant D: "*Yes, it is always like* [that]; *I am talking to my friend always, all the time about this*".

Facilitator: "*Oooh yes, and you would like to go to the field?"*

Participant D: "*Yes, definitely*".

Facilitator: "*Do people recognize this? Do you have other ideas* (...)?"

Participant I: *"In my context, I feel a* (...) *gap between* [now and] *after finishing my MSc;* [a gap between] (...) *me and my other colleagues,* (...) *specially my boys friends; at* [master degree] *level, my knowledge level* [and] *technical skill, and their knowledge level are equal, but...when we come to the practical implementation phase* (...), *just because they are boys, and because of the social circumstances, especially here* [in Nepal/at the DOI(?)], [boys] *get the chance to go to the field and interact;* [they are] *expose*[d] *and* [learn to] *use their knowledge practically in the field.* (...). *I don't know, just because* [we are] *ladies, or our social* [circumstances]; *I couldn't get* [an] *opportunity to go directly to the field, because* [for] *a geologist, the working area is very remote, and very hard terrain,* [and] *our parents* [think]; [and] *people just think that 'you are a girl' and 'you cannot climb the mountains, the hills'* (...).

Facilitator: "*There* [are] *no women in the mountains, right!?"*

Participant I: "(...). *For the boys, they can go* [every]*where. Because of that, there is* [now] *a gap between* [their and my] *practical knowledge and implementation knowledge; I feel that because of not going to field, I couldn't explore more practical and technical knowledge, and* (...) *I think, that is why I am been lacking* [behind], *compared to my own colleagues*".

Facilitator: "*Okay, you see there the difference (...), and it started after your masters, right?"*

Participant I: "*Yeah, after my masters,* (...). *After the university level.* [At university, boys] *are also studying, they are using* (...) *mental skill or knowledge level, and on college,* [girls also] *go to the field at the same time, we do the same work* [as boys], *but when counting the practical knowledge, the implementation or getting job opportunities, I found some discriminating... distance.*

Facilitator: "*Okay, that is interesting, because, like you say,* [at] *college you can still go with the whole group to the field, and now, it is changing once you get to the professional field?* (...)".

Source: Tape 1: 39:38-42:58

Annex 41: Summary of curriculum vitae of Mr. Nanda Kishore Agrawal

The overview presented below is based on information derived from an e-mail circulation of INPIM/N (9 February 2012).

Mr. Agrawal is considered one of the pioneers in the field of irrigation development in Nepal. He was one of the first Nepalese engineers of the Canal Department (est. 1952), built the first 'Nepalese' surface irrigation system in the Terai (Khageri Irrigation System, Chitwan District), and did assignments in the irrigation sector in different capacities – government employee, trainer, design and supervision engineer, manager, planner and consultant. He was memorized among engineers of the DOI as the 'Irrigation Man' of Nepal (INPIM/N e-mail circulation, 1, 9 and 11 February 2012).

Date of birth: July 1934
Passed away: 27 December 2011

Education:

1951:	School Leaving Certificate (SLC), top student in his batch.
1952-1953:	Intermediate science
1953-1957:	Bachelor civil engineering, Roorkee College, India.

Employment:

1957-1987: Government of Nepal: Canal Department, Department of Minor Irrigation (DMI), Department of Irrigation, Hydrology and Meteorology, Water and Energy Commission Secretariat (WECS).

- Training the overseers (1957-1959)
- Engineer in the Jhanj Irrigation Project (1959-1961)
- Executive Engineer of Khageri Irrigation Project (1961-66)
- Deputy Chief Engineer, Planning Division DMI (1966-1970)
- Chief Engineer, Department of Minor Irrigation (1970-72)
- Regional Director, Western Regional Irrigation Directorate (1972-74)
- Deputy Director General, Department of Irrigation (1974-1981)
- Executive Director, WECS (1981-1984).
- Project Manager, Western Koshi Canal Project (1974-81/ 1984-87)

1988-2003: Consultant/ Senior Irrigation Engineer/ Irrigation Expert.

- Preparation of second Master Plan for Irrigation (1988-1990)
- Formulation of Water Resources Strategy, Phase I (1996)
- Formulation of Water Resources Strategy, Phase II (1999-2000)
- Preparation of Expenditure Framework for irrigation sector (2001-02)
- Contribution on irrigation in National Water Plan (2003)

2003-2011: Retirement.

Annex 42: Summary of curriculum vitae of Mr. Bubanesh Kumar Pradhan

The overview presented below is based on a CV that was obtained from Mr. B.K. Pradhan.

Mr. Pradhan is a key figure of the irrigation engineering and water resources development community in Nepal (see B.K. Pradhan, 2009). He has been the DG of the DIHM, and a secretary of the MOWR. In this capacity, he held many negotiations with India on river sharing and water resources management. He is still active in his professional field, and has been dubbed the Water Emperor (*jal samrat*) by Mr. Jhal Nath Khanal, a UML politician, who later became the prime minister of Nepal (February to August 2011).

Date of birth: 21 December 1936

Education:

1954:	SLC, Juddhodaya English Public School, second student in his batch.
1955-1956:	Intermediate of science.
1956-1959:	Bachelor civil engineering, Roorkee College, India.
1965-1967:	MSc. civil engineering, University of Strathclyde, Glasgow, UK.

Employment:

1959-1992:	Government of Nepal: Canal Department, Department of Irrigation, Hydrology and Meteorology (DIHM), Water and Energy Secretariat Commission (WECS), Ministry of Water Resources (MOWR). - Assistant Engineer (1959). - Director General of the DIHM (1976). - Executive Secretary of the WECS (1980). - Secretary of the MOWR (1988). - Member Secretary of the National Planning Commission (1991).
1993 (or later):	- Member of National Water Resources Development Council.
1993 <:	Consultant/ Senior Irrigation Engineer/ Irrigation Expert. - Chairman of Association for Research and Management Services P. Ltd. Company.

Current positions (August 2011):

- Registered member of the Nepal Engineering Council (NEC).
- Founder member and ex-President of Roorkee University Alumni Association, Nepal Chapter.
- Founder member and ex-President of Society of Irrigation Engineers Nepal (SIREN).
- Life member of Nepal Engineers' Association (NEA).
- Life member of JICA Alumni Association of Nepal.
- Life member of Nepal Philatelic Society.
- Member of China Study Centre.

Annex 43: Definitions of irrigated area

This annex provides definitions of 'irrigated area' as presented in Table 18 in the main text.

1. Database for Irrigation Development (DOI/CERD, 2007):

The DBID database does not include a list of definitions.

The DBID reports numbers on irrigated area under 'command area' (ha) (sometimes also mentioned as 'service area'). For surface irrigation systems, it makes distinctions between 'planned command area' (gross and net), 'developed command area' (gross and net) and 'irrigated command area' (summer, winter and spring).

The numbers for *surface irrigation systems*, *groundwater irrigation* and *non-conventional irrigation* have been obtained from p.4 ('6. Highlights of irrigation development, [tables] 6.2, 6.3 and 6.4 (A) and (B)'). It mentions numbers under 'culturable command area' (ha) (surface and groundwater irrigation) and 'command area' (ha) (non-conventional irrigation).

2. **Irrigated Agriculture and Water Resources Assessment Report** (ADB, 2012a):

This report mentions various definitions of irrigated area and it includes a 2-page 'irrigation terminology' (p.iii-iv) .

The numbers for *surface irrigation systems* and *non-conventional projects* have been obtained from p.152 ('Annex 7: Irrigation statistics, Table A7.5'). It mentions the numbers under 'irrigable area' (ha) which is defined in the report as 'the area that can be irrigated in a given season; often the maximum area within an irrigation system that can be irrigated in a "normal" year' (see p.iii).

The numbers for *groundwater irrigation* have been obtained from p.109 ('Annex 4: Groundwater development, Table A4.1'). It mentions the numbers under 'area' (ha), without further specification.

3. Agricultural Census (CBS, 2006):

The Agricultural Monograph on irrigation (p.120-128) presents all numbers on irrigation under 'irrigated area' (ha), without further specification. No definition of 'irrigated area' is given in this document.

Annex 44: Irrigated area (ha) in Nepal

Scheme type		'Culturable Command Area' (CCA) (ha)	
		Irrigated area	'year-round irrigation'
Surface water irrigation	DOI schemes	314.521	172.212
	FMIS non-assisted	312.289	Not given
	FMIS agency assisted (rehabilitation)	295.258	262.617
	FMIS agency assisted (new)	38.169	32.458
Ground water irrigation	DOI projects (shallow wells)	53.964	53.964
	DOI projects (tube wells)	34.455	34.455
	DA projects, Janakpur (shallow wells)	18.151	18.151
	DA projects, Janakpur (tube wells)	3.645	3.645
	ADB-N projects (shallow wells)	167.943	167.943
Non-conventional projects		13.011	Not given
Total		**1.251.406**	**745.455**

Source: DOI/CERD, 2007.

Note: See main text for the definition of 'year-round irrigation'. The numbers presented under 'year-round irrigation' for the categories 'FMIS agency assisted (rehabilitation)' and –'(new)' are presented in the DBID under the category 'FMIS assisted'. This number has been divided by weight, 89% and 11% respectively, for the presentation of this table.

Annex 45: Irrigated area (ha) per scheme type in the ecological zones of Nepal

Scheme type	Terai	Hills	Mountains	Total
DOI schemes	295.698	16.963	1.860	314.521
FMIS non assisted	230.298	62.957	19.034	312.289
FMIS agency assisted (total)	209.815	100.531	23.081	333.427
Ground water (total)	278.158	0	0	278.158
Non-conventional	5.689	6.335	987	13.011
Total	**1.019.658**	**186.786**	**44.962**	**1.251.406**

Source: DOI/CERD, 2007.

Annex 46: Funding in the irrigation sector of Nepal (1950-2005)

Country/ organisation	Hectares	%	Time (since...)	Type of assistance
Government of Nepal (DOI, DA)	235.519	25,43%	1950s	AMIS/FMIS
India (IAM)	145.318	15,69%	1950s	AMIS/FMIS
US (USOM/USAID)	21.809	2,36%	1950s	FMIS
Japan	21.796	2,35%		
UN (ILO, IFAD, UNDP, UNCDP)	25.975	2,80%	1970s	AMIS/FMIS
World Bank (WB)	141.637	15,29%	1970s	AMIS/FMIS
Asian Development Bank (ADB)	271.622	29,33%	1970s	AMIS/FMIS
China	1.030	0,11%	1980s	AMIS
South Korea	1.750	0,19%	1980s	AMIS
UK (DFID)	1.403	0,15%	1980s	FMIS
Netherlands (SNV)	2.526	0,27%	1980s	FMIS
Germany (GTZ/GIZ)	185	0,02%	1980s	FMIS
Care/Nepal	4.805	0,52%	1980s	FMIS
Canada (CIDA)	1.403	0,15%	1980s	FMIS
Denmark (DANIDA)	2.179	0,24%	1980s	FMIS
EU	4.863	0,53%	2000s	FMIS
Saudi Arabia (Saudi Fund)	23.400	2,53%	2000s	AMIS
Kuwait	5.800	0,63%	2000s	
Unidentified	13.026	1,41%	-	
Total	**926.106**	**100%**		

Source: DOI/CERD, 2007.

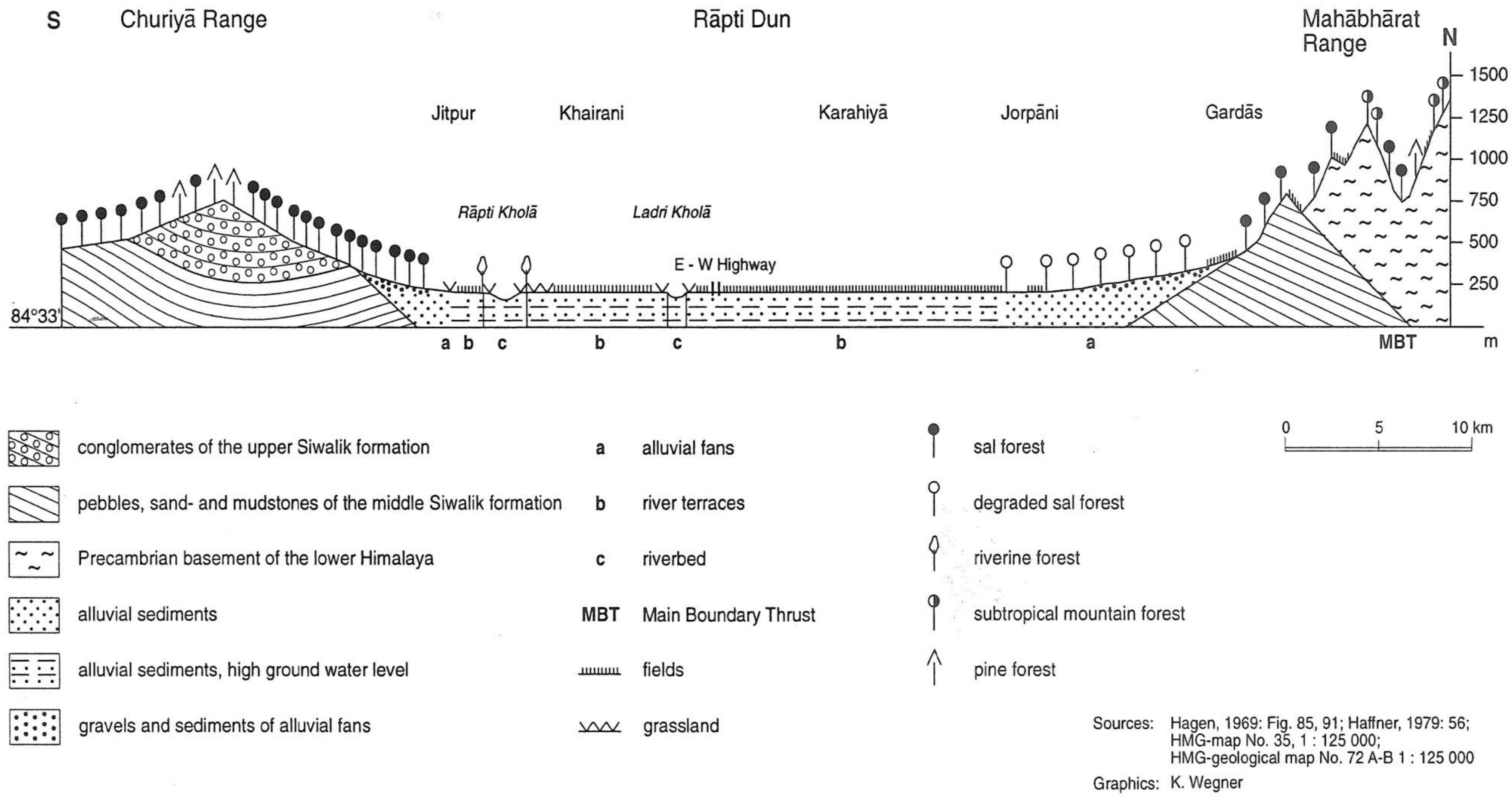
Note: The area mentioned under 'ADB-N' (187.321 ha) in DOI/CERD (2007) is subdivided over the Government of Nepal (40%), US (10%) and the ADB (50%). This division is an assumption based on the following information. In the 1950s and 60s, the ADB-N was known as the 'Agricultural Cooperative Bank', receiving funding from the USAID (Sakiyama, 1971: 29). In 1969, this bank was transformed into the 'Agricultural Development Bank of Nepal' (ADB-/N). It started lending operations to farmers in the same year (Sakiyama, 1971: 4), and received funding from the ADB and from the government of Nepal.

Annex 47: Executing agencies in the irrigation sector of Nepal (1950-2005)

Executing agency	Programme/scheme	Source	Hectares
DOI	DOI schemes	SURFACE WATER	214.928
	ILC		29.627
	RIRDP		1.255
	SHIP		3.108
	DOI rehabilitation FMIS		52.184
	ERIP		8.155
	Small Irrigation		2.568
	ISP		57.582
	MAIN		2.117
	MIN		30.135
	NISP		46.703
	SINKALAMA		3.023
	SIP		5.496
	SISP		36.059
	Kailali Kanchanpur Tubewell IP	SHALLOW WELLS	328
	SIRDP		11.625
	ILC		847
	Community Shallow Tubewell Project		4.885
	NISP		366
	APP		11.036
	CGISP		24.500
	Satbariya IP		220
	Baisebichhuwa IP		150
	Mohana IP		37
	Kailali Kanchanpur Tubewell IP	DEEP TUBEWELL	210
	Bhairahawa Lumbini Groundwater Project		20.309
	SIRDP		550
	Kapilvastu Nalkup IP		60
	Mahottari Nalkup IP		823
	Seti Integrated Rural Development Project		1.100
	ILC		3.455
	Irrigation Development Project		680
	NISP		4.928
	APP		1.670
	Narayani Zone Irrigation Development Project		500
	Rahat DTW		100
	Aparesota (Bargadawa)		70
DA	Agricultural Development Project Janakpur	**Wells**	21.796
India	DOI schemes	**Surface**	77.650
ADB-N	ADB-N (FMIS)	**Surface**	16.912
	ADB-N (shallow wells)	**Wells**	167.943
Integrated programmes	SIRDP	SURFACE WATER	17.230
	DIDP		2.179
	KBIRD		1.403
	KHILL		1.403
	M/HILL		2.526
	MPLD		3.109
	PEOPLE		2.703
Unidentified	AGRIL	SURFACE WATER	600
	GADP		120
	GTZ (now GIZ)		180
	HFP		1.741
	Unidentified		410
Total			**936.106**

Source: DOI/CERD, 2007.

Annex 48: The ecological zones of Chitwan District

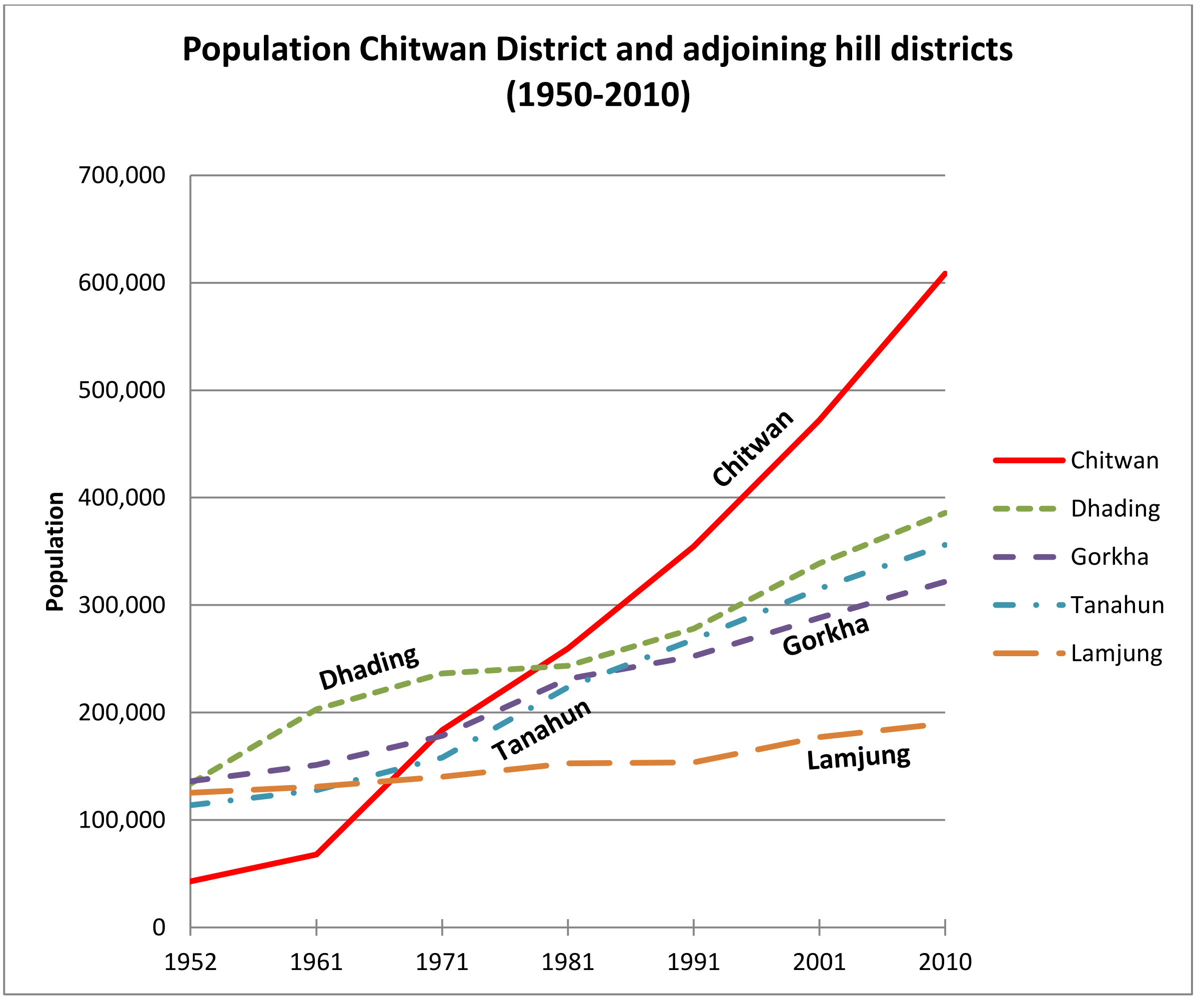


Source: Müller-Böker, 1999: 25

Annex 49: Population growth in Chitwan District

Year	Chitwan	Adjoining hill districts			
		Dhading	Gorkha	Tanahun	Lamjung
1952	42.724	133.562	135.975	113.677	125.329
1961	67.882	203.039	151.264	127.642	130.935
1971	183.644	236.276	178.262	158.139	140.226
1981	259.571	243.401	231.294	223.438	152.720
1991	354.488	278.068	252.524	268.073	153.697
2001	472.048	338.658	288.134	315.237	177.149
2010*	608.422	385.847	321.932	355.989	189.810

Source: CBS, 2001 (population census); *projection of CBS.



Annex 50: Landholdings in Chitwan and area under irrigation

Year	Total area of holding	Total area		Total irrigated area by source											
		No. of holdings	Area (ha.)	No. of irrigated holdings	Area (ha.)	Tube/ boring only		Perennial only		Seasonal only		Pond/ tank only		Others	
						No. of holdings	Area (ha.)	No. of holdings	Area (ha.)	No. of holdings	Area (ha.)	No. of holdings	Area (ha.)	No. of holdings	Area (ha.)
1961	Holdings without land	0	0												
1971	"	0	0												
1981	"	0	0												
1991/92	"	387	4												
2001/02	"	74	0.5												
1961	Holdings with land	3.914	9.267	3.914	9.267	-	-	449	318	3.465	8.949	-	-	-	-
1971	"	19.831	33.638	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	33.263	-	12.165	13.100	5.187	5.624	-	-	-	-	6.480	6.776	-	-
1991/92	"	53.041	42.810	31.737	24.460	1.828	1.082	5.119	4.322	24.293	17.492	638	279	2.103	1.284
2001/02	"	71.355	42.113	55.345	28.442	12.592	4.655	12.369	6.421	32.576	16.127	74	26	3.232	1.042
1961	Under 0,1 ha	73	1	73	1	-	-	10	-	63	0,7	-	-	-	-
1971	"	644	47	-	-	-	-	-	-	-	-	-	-	-	-
1981	(SEE UNDER 0,5 HA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991/92	"	5.423	269	968	39	28	1	221	8	636	27	0	0	83	3
2001/02	"	7.875	414	3.009	139	929	37	260	15	1.337	67	0	0	371	16
1961	0,1 ha and under 0,2 ha	150	3	150	3	-	-	53	1	104	2	-	-	-	-
1971	"	749	140	-	-	-	-	-	-	-	-	-	-	-	-
1981	(SEE UNDER 0,5 HA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991/92	"	5.728	805	2.324	278	111	10	249	36	1.881	222	28	3	83	8
2001/02	"	10.326	1.449	7.615	922	2.340	264	1.263	148	4.086	493			223	17
1961	0,2 ha and under 0,5 ha	209	20	209	20	-	-	43	1	166	19	-	-	-	-
1971	"	2.380	932	-	-	-	-	-	-	-	-	-	-	-	-
1981	(UNDER 0,5 HA)	11.028	-	872	195	465	119	-	-	-	-	407	76	-	-
1991/92	"	13.087	4.285	7.083	1.901	360	83	1.162	321	5.202	1.378	111	29	387	90
2001/02	"	21.952	7.202	18.349	5.236	4.309	1.139	4.160	1.115	10.289	2.722			1.151	260
1961	0,5 ha and under 1 ha	234	58	234	58	-	-	42	5	192	52	-	-	-	-
1971	"	4.760	3.840	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	5.616	-	2.007	984	989	480	-	-	-	-	989	402	-	-
1991/92	"	13.336	9.248	9.380	5.182	609	241	1.577	859	7.222	3.836	194	67	443	179
2001/02	"	18.795	13.019	15.972	9.259	3.826	2.052	3.454	1.810	9.732	5.040	37	5	891	288
1961	1 ha and under 2 ha	618	303	618	303	-	-	52	6	566	297	-	-	-	-
1971	"	6.573	10.378	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	7.792	-	4.159	3.176	1.716	1.430	-	-	-	-	2.269	1.611	-	-
1991/92	"	10.597	14.007	7.803	7.771	415	347	1.107	1.060	6.170	5.745	221	94	775	526
2001/02	"	9.658	12.587	8.246	8.547	966	932	2.637	2.336	5.535	4.933	37	21	409	288

...table continues at the next page.

Continued from the previous page...

Year	Total area of holding	Total area		Total irrigated area by source											
		No. of holdings	Area (ha.)	No. of irrigated holdings	Area (ha.)	Tube well/ boring only		Perennial only		Seasonal only		Pond/ tank only		Others	
						No. of holdings	Area (ha.)	No. of holdings	Area (ha.)	No. of holdings	Area (ha.)	No. of holdings	Area (ha.)	No. of holdings	Area (ha.)
1961	2 ha and under 3 ha	567	946	567	946	-	-	31	35	536	911	-	-	-	-
1971	"	2.471	6.399	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	3.515	-	2.094	2.377	756	929	-	-	-	-	1.251	1.339	-	-
1991/02	"	3.459	8.058	2.878	5.053	277	345	470	844	2.158	3.447	28	42	249	375
2001/02	"	1.969	4.627	1.486	2.674	149	169	371	547	1.077	1.785			186	173
1961	3 ha and under 4 ha	574	832	574	832	-	-	104	140	470	691	-	-	-	-
1971	"	1.246	4.412	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	1.978	-	1.163	1.831	407	588	-	-	-	-	669	1.048	-	-
1991/02	"	913	3.137	858	1.994	28	56	111	262	692	1.610	28	33	55	33
2001/02	"	520	1.717	483	1.166	37	38	111	211	409	852				
1961	4 ha and under 5 ha	293	522	293	522	-	-	31	55	262	467	-	-	-	-
1971	"	322	1.510	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	1.309	-	988	1.794	465	785	-	-	-	-	523	1.009	-	-
1991/92	"	277	1.201	249	767			111	281	194	415			28	70
2001/02	"	260	1.098	186	499	37	25	111	239	111	235				
1961	5 ha and under 10 ha	750	2.210	750	2.210	-	-	73	69	677	2.006	-	-	-	-
1971	"	539	3.623	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	1.897	-	772	1.996	337	849	-	-	-	-	314	862	-	-
1991/92	"	138	901	111	669	0	0	28	183	83	476	28	11	0	0
2001/02	"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961		409	4.506	409	4.506	-	-	10	5	429	4.500	-	-	-	-
1971	10 ha and over	147	2.357	-	-	-	-	-	-	-	-	-	-	-	-
1981	"	128	-	110	837	52	444	-	-	-	-	58	393	-	-
1991/92	"	83	900	83	806	0	0	83	469	55	337	0	0	0	0
2001/02	"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	**Total**	**3.914**	**9.267**	**3.914**	**9.267**	**-**	**-**	**449**	**318**	**3.465**	**8.949**	**-**	**-**	**-**	**-**
1971	**Total**	**19.831**	**33.638**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
1981	**Total**	**33.263**	**-**	**12.165**	**13.100**	**5.187**	**5.624**	**-**	**-**	**-**	**-**	**6.480**	**6.776**	**-**	**-**
1991/92	**Total**	**53.428**	**42.814**	**31.737**	**24.460**	**1.828**	**1.082**	**5.119**	**4.322**	**24.293**	**17.492**	**638**	**279**	**2.103**	**1.284**
2001/02	**Total**	**71.429**	**42.113**	**55.345**	**28.442**	**12.592**	**4.655**	**12.369**	**6.421**	**32.576**	**16.127**	**74**	**26**	**3.232**	**1.042**

Source: Agricultural census 1961, 1971, 1981, 1991/92 and 2001/02 of CBS. In the 1971 agricultural census, no specific data was collected on irrigation (only "wet" and "dry" land holdings).

Annex 51: Irrigation project development in Chitwan District (1950-2010)

Irrigation scheme type	Programme or irrigation project (IP) (name and/or no. of IP)	Execu-ting agency	Year of project implemen-tation	Planned command area (ha)		Developed command area (ha)		Irrigated command area (ha)		
				Gross	Net	Gross	Net	Summer (monsoon)	Winter	Spring
Government of Nepal	RVDP	-	1952-1960	-	-	-	-	-	-	-
DOI project	Chitwan IP (KIS, NLIS, PIS)	DOI	1960-1995	13.400	10.400	13.400	10.400	8.300	2.000	-
	Pituwa IP	DOI	1962-1968	600	500	600	500	500	100	-
	Total			**14.000**	**10.900**	**14.000**	**10.900**	**8.800**	**2.100**	**-**
FMIS (rehabilitation and new) *(149 FMIS projects in total; some systems have been rehabilitated twice)*	FIWUD (11x)	DA	1973-1988	2.140	1.710	2.140	1.710	1.710	0	0
	SIP (1x)	DOI	1989	125	100	125	100	100	50	0
	HMG-N (7x)	DOI	1989-1991	1.376	1.100	1.376	1.100	1.100	210	0
	ADB-N (3x)	DOI	1992	252	202	252	202	0	0	0
	ISP (9x)	DOI	1991-1996	2.737	2.219	2.737	2.219	2.137	1.315	424
	ERIP (100x)	DOI	1994-1997	11.400	9.103	10.215	8.155	5.168	4.023	829
	ADB-N new (1x)	DOI	1995	330	264	330	264	264	159	70
	ISP new (1x)	DOI	1995	312	265	312	265	300	270	130
	MIP (6x)	DOI	-	563	450	563	450	450	0	0
	Care-Nepal (2x)	ADB-N	1983-1989	563	450	563	450	450	0	0
	SISP (6x)	DOI	1998-2001	505	429	505	429	0	0	0
	SISP new (1x)	DOI	1999	35	30	35	30	0	0	0
	Total			**20.338**	**16.322**	**19.153**	**15.374**	**11.881**	**6.063**	**1.453**
Surface irrigation	**Total**			**34.338**	**27.222**	**33.153**	**26.274**	**20.681**	**8.163**	**1.453**
Shallow tube wells *(1005 shallow tube wells in total)*	ADP-Janakpur (2x)	DA	1980s	14	*(Same values used in the columns like in DBID database)*		14			
	ADB-N (604x)	ADB-N	1983-2000	1.799			1.799			
	APP (197x)	DOI	1997-2015	493			493			
	CGISP (202x)	DOI	1996-2007	707			707			
	Total			**3.013**			**3.013**			
Deep tube wells	APP (7x)	DOI	1997-2015	280			280			
	Total			**280**			**280**			
Groundwater irr.	**Total**			**3.293**			**3.293**			
Non-conventional	Sprinkler (33x)	ADB-N	1996 <	17	*(Same values used in the columns like in DBID database)*		17			
	Rower (45x)	ADB-N	1996 <	23			23			
	Unspecified (2x)	DOI	-	16			16			
Non-conventional irr.	**Total**			**56**			**56**			
TOTAL AREA FOR IRRIGATION				**37.687**	**(‘planned’)**		**29.623**	**(‘irrigated’)**		

Source: DOI/CERD, 2007 (Chitwan District). See for abbreviations next page.

Abbreviations used in Annex 51:

As presented in the Database for Irrigation Development (DBID) (DOI/CERD, 2007).

ADB-N = Agricultural Development Bank, Nepal.
ADP-Janakpur = Agricultural Development Project, Janakpur.
APP = Unspecified (perhaps part of Agricultural Perspective Plan).
CGISP = Community Groundwater Irrigation Sector Project.
ERIP= East Rapti Irrigation Project (funded by Asian Development Bank).
FIWUD = Farmer Irrigation and Water Use Division (part of Department of Agriculture).
HMG-N = His Majesty's Government of Nepal (name of the government before 1990).
ISP = Irrigation Sector Project (funded by Asian Development Bank).
KIS = Khageri Irrigation System
MIP = Minor Irrigation Programme (programme of Government of Nepal).
NLIS = Narayani Lift Irrigation System
PIS = Panchakanya Irrigation System
RVDP = Rapti Valley Development Project
SIP = Small Irrigation Programme (programme of HMG-N).
SISP = Second Irrigation Sector Project (funded by Asian Development Bank).

Two notes for Annex 51:

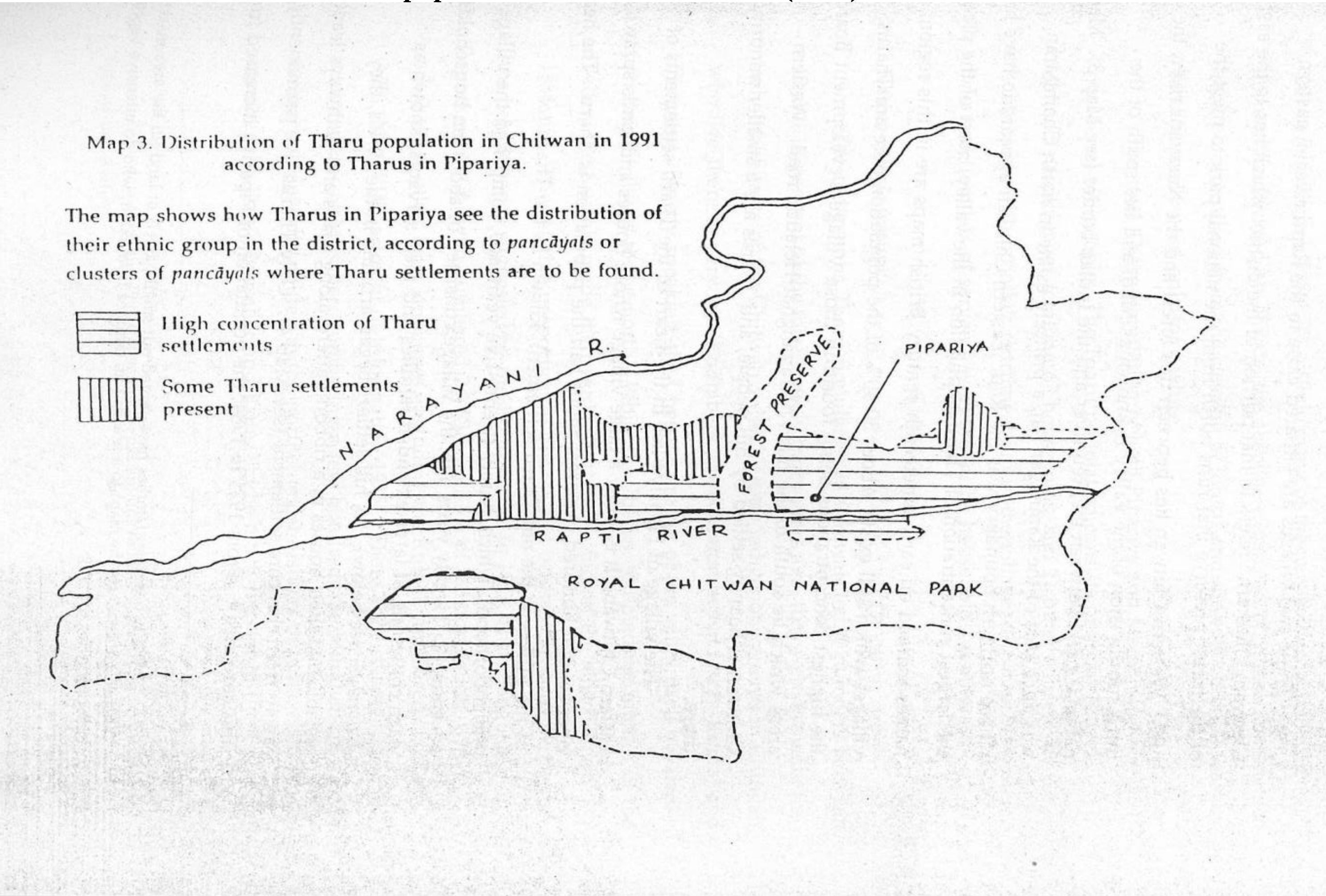
Note one: ***Not all wells that are counted, are constructed yet.*** The Groundwater Resources Development Board (GWRDB) of the DOI mentioned that a total of 383 shallow and dug wells had been constructed under the 'APP programme' (1997-2015) in 2010 (or 2067/68 BS) (GWRDB, 2010). In Annex 51, the total planned number is mentioned.

Note two: ***In reality, the number of (shallow) wells is much higher.*** In a survey for three villages in West Chitwan (Mangalpur 7/8, Sharadanagar 5 and Sharadanagar 7/9 (n=89), I found that 41 households (46%) owned or had 'direct access' to an open well (shallow or dug well) (see p.50-51 of field report for Water Equity Gauge). In fact, in the valley area (53% of Chitwan District), I was under the impression that almost every household owned, or had direct access to, a shallow well (for drinking water, but also livestock and irrigation). A simple calculation suggest that there are far more shallow and dug wells in Chitwan than is mentioned in the irrigation statistics, constructed by farmers and through private initiative.

A simple calculation:

- Total population Chitwan: 600.000
- Population in the valleys: 53% x 600.000 = 318.000 people (reasonable estimate; a relative larger section of the population lives in the valley, but there is also population in the city where access to water is different – this 'levels out').
- Number of households (assuming that 10 people in the household rely on a well, this may be closer to 5 in practice). Thus: 318.000/ 10 = 31.800 'rural valley households'.
- Number of shallow wells in Chitwan: 46% x 31.800 = **14.628 wells**.
- The DBID of the DOI mentions only a total of 1.012 wells (including shallow and deep tube wells), and that is actually for 2015 (see note one). In short, even if my calculation is wrong by a factor 2 or 3, it appears that there are far more shallow wells in Chitwan than mentioned by the statistics

Annex 52: Distribution of Tharu population in Chitwan District (1991)



Source: Guneratne, 1994: 97

Other maps in Müller-Böker (1999) show that there were also Tharu populations south of the Rapti River, before the installation of the Royal Chitwan National Park.

Annex 53: Translation of the jimindar patta (1939)

The document had been translated 'double'. First, from the 'old' Nepalese sanskriet to contemporary Nepalese, and then, from Nepalese to English.

To: Chitwan Revenue Office

Mr. Dhani Ram Mahato was a jimindar of Meghauli Mauja of Chitwan District. He had '141-2-4 bigha' of land in his mauja [village area] for which the total revenue was NRs 458.62. Under total Mauja, 39-2-3 bigha of land was 'Jirayat' whose revenue was NRs. 125.24. In 18th of Kartik, 1994 BS, Mr. Dhani Ram Mahato passed away. Mr. Madari Mahato, a brother cum second person of Mr. Dhani Ram Mahato family, submitted a request letter to Revenue office for Jimindari position in 1994 BS, after a death of Mr. Dhani Ram Mahato (18th Kartik 1994 BS). On 10th Magh 1994 BS, the Revenue office decided to provide jimindari position to Madari Mahato as he had sufficient document to show his rights.

Few of the conditions to be followed by Mr. Madari Mahato:

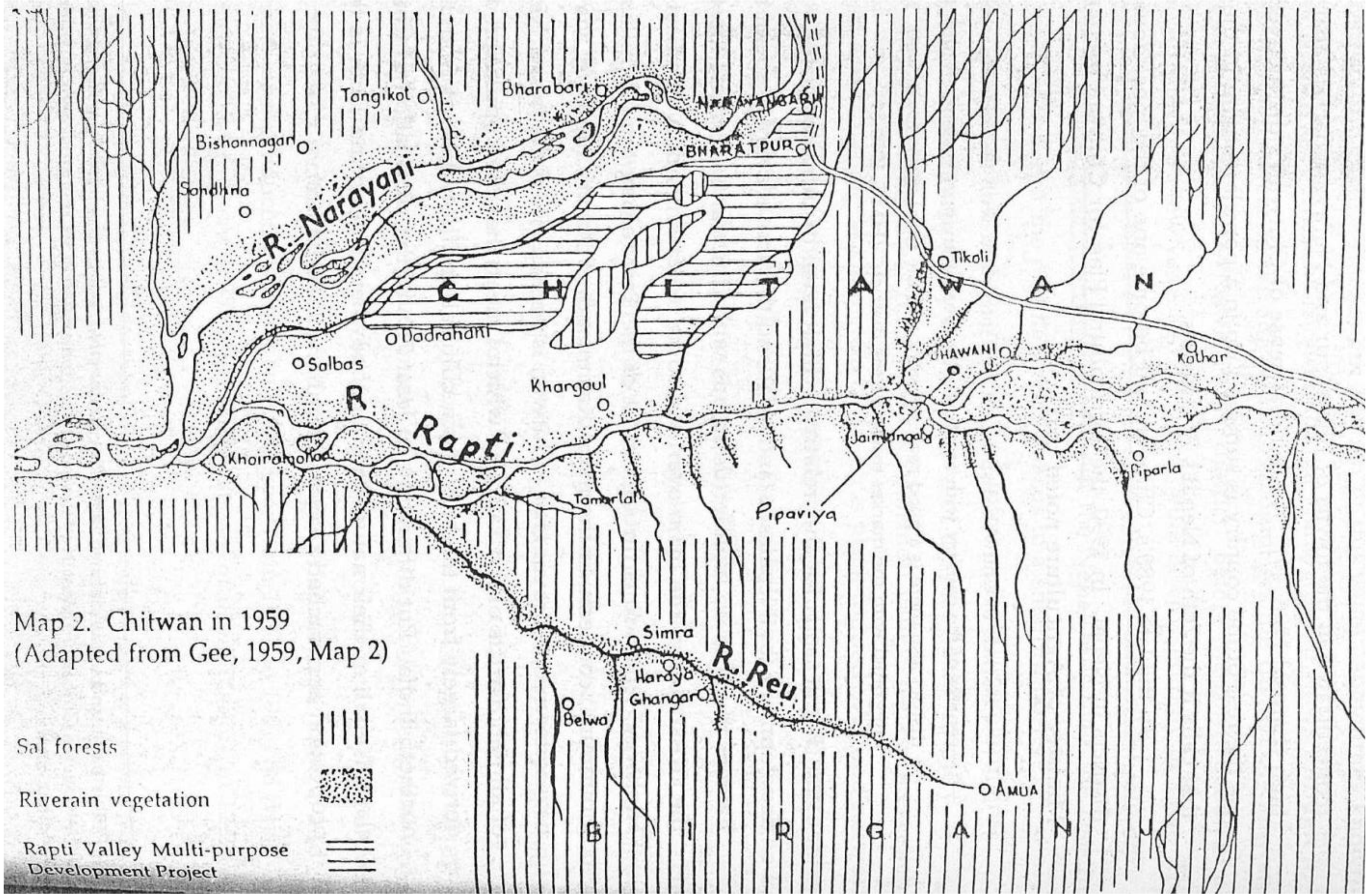
1. He has to pay revenue from 1995 BS onwards
2. Need to keep 'Raiti' happy and satisfy.
3. Pay Revenue timely of associated Mauja as per the government rules and regulations.
4. Not to put high tax in the Mauja
5. Not to ill-treat 'Raitis'
6. Need to help government yearly official works
7. Need to reside/follow government rules and norms &;
8. Government will not entertain information regarding losses

In 30th' Chaitra of 1995, Revenue office in Birgunj approved the decision forwarded with the above mentioned conditions to be adopted. If he (Mr. Madaari Mahato) remained and followed the conditions, his Jimindari is assured. If not, he will be expelled or disqualified as Jimindar plus he will be sentenced to other charges.

Date: 1996-01-07 BS

Notes:
1. In the stamp, black one: "Shree Chitwan Maal"
2. Letter was drafted in 1939-04-19 AD

Annex 54: Map of Chitwan (1959) and area targeted for settlement in the RVDP



Source: Guneratne, 1994: 94

Annex 55: A list of irrigation engineers who have worked in Chitwan District

Project/ office	Name of engineer	Jaat[1]	Year		Remark[2]
			BS	AD	
Rapti Irrigation Project (later known as KIS) & Pithuwa Irrigation Project (under the Minor Irrigation Programme) (1960-1969 AD)[3]	Nanda Kishwor Agrawal	Madhesi	2017(?)-2024	1960(?)-1967	BE Civil (Roorkee College, 1957) (passed away) Chief engineer Rapti Irrigation Project Chief engineer Minor Irrigation Programme
	Surya Bhakta Uphadya	B/C	2018-2025	1961-1968	BE Civil (Baroda University, 1950s) Engineer Rapti Irrigation Project
	Karna Dhoj Adhikari	B/C	2024-2028	1967-1971	Chief engineer Rapti Irrigation Project/KIS in 1969
Khageri Irrigation Office (1969-1972)	Surya Bhakta Uphadya	B/C	2029-2030	1972-1973	BE Civil (Baroda University, 1950s) Superintending engineer KIS
Chitwan Irrigation Project Office (under Chitwan Valley Development Board) (1973-1994)	Gokul Lal Amatya	B/C	2030(?)-2037	1973(?)-1980	Project engineer (passed away)
	Guna Nanda Thakur		2037-2039	1980-1982	Project engineer
	Gokul Lal Amatya	B/C	2039-2041	1982-1984	Project engineer (passed away)
	Som Nath Poudel	B/C	2041-2043	1984-1986	Project engineer (later Director General of the DOI)
	Mahendra Math Aryal	B/C	2043-2045	1986-1988	Project engineer
	Sharada Prasad Sharma	B/C	2045-2047	1988-1990	Project engineer (retired secretary)
	Komal Prasad Timilsina	B/C	2047-2049	1990-1992	Project engineer
	Archyut Man Singh	B/C	2049-2051	1990-1994	Project engineer; CIP dissolved, first NLIO chief
Narayan Lift Irrigation Office (NLIO) (1994-2002)	Puspa Raj Khanal	B/C	2051-2054	1994-1997	Project/District engineer
	Shanti Kumar Hyaja		2054-2055	1997-1998	Project/District engineer (8 months only)
	Ram Prasad Adhikari	B/C	2055-2057	1998-2000	Project/District engineer
	Khem Bahadur Pathak		2057-2059	2000-2002	Project/District engineer (agricultural engineer)
Central Region Irrigation Development Division, 5 (CRIDD-5) (2002<)	Komal Prasad Regmi	B/C	2059	2002	Divisional engineer (3 months only)
	Rajendra Prasad Adhikari	B/C	2059-2061	2002-2004	Divisional engineer
	Rakesh Kumar Jha	Madhesi	2061-2063	2004-2006	Divisional engineer
	Abodh Kiswhor Prasad	Madhesi	2063-2065	2006-2008	Divisional engineer
	Ram Prasad Adhikari	B/C	2065-2067	2008-2010	Divisional engineer
	Bharat Manij Dhital	B/C	2067 <	2010 <	Divisional engineer

(1) All the engineers in this table are men. I am not sure about the jaat background of some names and I have left the box empty.

(2) All the engineers can be assumed to be (or have been) civil engineers by training. Khem Bahadur Pathak was mentioned as the exception.

(3) Overseers in this period were: 'Mr. Varjis' (Indian; from 1958-1963, he came from Madras); Mr. K.P. Nairo (Indian; in1961, he came from Madras); Mr. Bhatta (Nepalese; in 1961) and 'Mr. Mishra Purushotam' (Nepalese; in 1961). I am not sure about the spelling of some names.

List of publications

Refereed publications

Zwarteveen, Margreet Z.; and Janwillem Liebrand. Forthcoming. Performing modernity: The scalar politics of irrigation development in Nepal. In: Emma S. Norman, Christina Cook and Alice Cohen (eds.). *Negotiating water governance: Why the politics of scale matter.* Surrey, UK: Ashgate Publishers.

Singh, Manpriet; Janwillem Liebrand and Deepa Joshi. 2014. Cultivating "success" and "failure" in policy: Participatory Irrigation Management in Nepal. *Development in Practice*, 24 (2): 155-173.

Liebrand, Janwillem; Margreet Z. Zwarteveen; Philippus Wester; and Barbara van Koppen. 2012. The deep waters of land reform: Land, water and conservation area claims in the Olifants Basin, Limpopo Province, South Africa. *Water International*, 37 (7): 773-787.

Vuren, Gerrit van; Janwillem Liebrand; and Linden Vincent. 2009. Debating the water professional of tomorrow. *Irrigation and Drainage*, 58 (S2): S162-S167.

Non-refereed publications

Liebrand, Janwillem; and Manpriet Singh. 2012. Case 5: Panchakanya Irrigation System, Chitwan. In: *Case studies of water users' associations in Nepal.* International Network of Participatory Irrigation Management, Nepal (INPIM/N), 39-50. Kathmandu, Nepal: INPIM/N.

Liebrand, Janwillem; and Saroj Yakami. 2011. The success of the WUA of Pauwa Sartapp irrigation system: strong leadership and external funds. In: Tribhuvan Paudel, Suman Sijapati and Richiram Sharma Neupane (eds.). *Participatory irrigation and examples of practices of water users' associations in Nepal*, 53-56. Kathmandu, Nepal: International Network of Participatory Irrigation Management, Nepal.

Liebrand, Janwillem. 2010. Masculinities: a scale challenge in irrigation governance in Nepal. In: Prachanda Pradhan, Upendra Gautam and Naveen Joshi (eds.). *Dynamics of farmer managed irrigation systems: socio-institutional, economic and technical contexts*, 53-72. Proceedings of the fifth international seminar, 25-26 March 2010. Kathmandu, Nepal: Farmer Managed Irrigation System Promotion Trust.

Liebrand, Janwillem. 2009. *Farmers' territory invaded by a water company: The effects of drinking water privatization on rice farmers in Calapan City, the Philippines.* Köln, Germany: LAP Lambert Publishers.

Liebrand, Janwillem. 2009. *The deep waters of land reforms: a case study on land and water reforms in the Olifants basin, South Africa.* Köln, Germany: LAP Lambert Publishers.

Talati, Jayesh; and Janwillem Liebrand. 2005. Evolving irrigation management institutions in Sardar Sarover Project, India. In: Prachanda Pradhan and Upendra Gautam (eds.). *Farmer managed irrigation systems and governance alternatives*, 258-283. Proceedings of the third international seminar, 9-10 September 2004. Kathmandu, Nepal: Farmer Managed Irrigation System Promotion Trust.

Conference, seminar and workshop papers

Liebrand, Janwillem. 2012. "Masculinities and irrigation engineering in the rugged mountains of Nepal". Third International Workshop on Comparative Water Studies, Wageningen University, the Netherlands, 31-5-2012 and 1-6-2012.

Liebrand, Janwillem. 2012. "Struggling to perform: Analysing masculinities and professional cultures among men and women irrigation engineers in Nepal". Wageningen School of Social Science (WASS), PhD Day, Wageningen, the Netherlands, 10-5-2012.

Liebrand, Janwillem. 2012. "Masculine performances and good projects: Reflections on interviews with/between engineers in Nepal". Netherlands Research School for Gender Studies (NOG), Nijmegen, the Netherlands, 9-3-2012.

Liebrand, Janwillem. 2011. "Engineering Chitwan (1950-2010): Research on engineering cultures in the water sector in Nepal from a history/gender perspective". Martin Chautari, Kathmandu, Nepal, 16-8-2011.

Liebrand, Janwillem. 2010. "From superman to outcast and activist: The man behind an agricultural engineer and water professional in Nepal". Action Research Action Learning Interest Group (ARALIG), PhD Course, Uppsala, Sweden, 3-6-2010.

Liebrand, Janwillem. 2009. "Experimental research on 'masculinities' in 'irrigation governance'". EXPERIMENT! PhD Course, Wageningen, the Netherlands, 9-1-2009.

Liebrand, Janwillem. 2008. “Defining a feminist practice of research: For research to investigate masculinities in the irrigation sector in South Asia”. NOISE Summer School, Netherlands Research School for Gender Studies (NOG), Utrecht, the Netherlands, 29-8-2008.

Liebrand, Janwillem. 2008. “Becoming a researcher, an action researcher or a researching activist? Articulating a practice of science for research on masculinities in the irrigation sector in Sri Lanka’. Action Research Action Learning Interest Group (ARALIG), PhD Course, Budapest, Hungary, 25-6-2008.

Popular publications

Liebrand, Janwillem; and Gerrit van Vuren. 2008. Waterdeskundige gaat brede toekomst tegemoet. *H_2O*, (7): 30.

Summary

This thesis documents my attempt to study masculinities among irrigation engineers and water professionals in Nepal. It is based on the recognition that more than two decades of mainstreaming gender in development research and policy have failed to come to grips with the masculine subject. In this thesis, it is hypothesized that there is something intrinsically masculine about the irrigation and water management profession, both in the West and in Nepal. This hypothesis is based on personal experience, being a male researcher myself and being trained as an irrigation professional in the Netherlands, and having travelled to India and Nepal to meet irrigation engineers and water professionals in an intercultural context. The hypothesis is also based on academic questioning of masculinities in irrigation. The aim of the thesis is to scrutinize a taken-for-granted association of men with organisational power, authority and expertise in irrigation. To facilitate investigations, two domains in the world of irrigation are conceptualized: the domain of the irrigation professional and the domain of irrigation expert knowledge. For each of these domains, a set of research questions has been formulated. First, how does one become an irrigation engineer in Nepal, employed in the Department of Irrigation, and what masculinities might be involved in becoming one; and second, how might masculinities be implicated in irrigation knowledge and water expert thinking. To answer the first question, this thesis analyses the institutions of engineering education, professional associations and regulatory bodies, and the Department of Irrigation. To answer the second question, this thesis analyses the use and presentation of irrigation data in policy making and it examines histories of irrigation expert thinking in Nepal.

The conceptual backbone of the thesis is to see professional performance in irrigation as cultural performance, drawing inspiration from the work of Victor Turner in particular. In Chapter 1, I explain that the metaphor of performance can be read as technical performance and cultural performance, conceived in this thesis as two sides of the same coin, mutually constituting professional performance. In the process of research, I have come to see the concept of cultural performance as particularly apt for this thesis. It has enabled me to conceptualize linkages between the gender of engineers, professional cultures in irrigation and technical representations in irrigation knowledge, without having to exclude myself from the writing process. The latter is important in research on masculinities because identifications of masculinities and femininities are unavoidably interpretative, situated and partial.

Chapter 2 presents historical contexts of irrigation development in Nepal, highlighting the main state interventions in the sector and some of the changes in professional practice in irrigation. It also presents a background on the education system and the civil service in Nepal

from the 1950s onwards, highlighting gendered aspects of these institutions and revealing that they have functioned as closed institutions of the high-class, upper-caste elite in Nepal. It also documents a history of women professionals in rural development in Nepal, in an attempt to understand why there are so few female irrigation engineers in the Department of Irrigation. As part of this analysis, I briefly re-visit the introduction of 'social organisers' in irrigation in the early 1990s, in an attempt to figure out why social organiser positions were not taken up by women professionals as community specialists. The analysis reveals that the position of women professionals, from the 1950s onwards, has mainly been defined in terms of their 'feminine capacity' to deal with 'women's issues', marked by their non-involvement in broader issues of development.

Chapter 3 presents feminist histories of the main institutions that constitute the roadway for becoming an irrigation engineer in Nepal. The first institution is engineering education, focussing on Nepal but also mentioning the places abroad (mainly in India) where Nepalese men (and some women) have gone for engineering education. The focus is mainly on diploma (overseer) and bachelor (engineer) level education in the disciplines of civil – and agricultural engineering. For these disciplines, I have collected gender and caste segregated enrolment data of students at engineering colleges in Nepal (going back to the 1980s). A second set of institutions are the regulatory organisations for the engineering profession in Nepal and the professional associations that exist in relation to the field of engineering, water, agriculture and irrigation. It presents an analysis of about 40 professional associations and also discusses some of the incipient networks of women professionals in natural resources management. The third institution is the Department of Irrigation, describing its history from 1952 onwards (year of establishment), and presenting an analysis on who is employed in the organisation. The analysis of the institutions reveals that they mainly have been the world of men.

Chapter 4 focusses on the informal milieu in the Department of Irrigation to understand how one becomes a 'real' irrigation engineer. The analysis is based on the assumption that getting an engineering degree, and becoming a member of an engineering association and securing employment in the civil service of the Department of Irrigation, does not automatically make a person a 'real' irrigation engineer. It is hypothesized that junior engineers need to participate in the informal milieu of the institutions, develop agency and acquire the desire, skills and perceptions that 'fit' a normative and gender authentic performance of a 'real' irrigation engineer. The development of agency and desire is conceptualized to occur through two distinct yet interrelated processes, which I call 'self-normalization' and 'transitional performance'. The analysis reveals that the informal milieu of the Department of Irrigation is infiltrated with social stereotypes and cultural norms that prevail in (elite) society in Nepal, causing barriers, particularly for women, to perform as 'real' irrigation engineers. The analysis also identifies two periods in the lives of engineers that can be conceived as rites of passage for becoming an irrigation engineer: ‘the college’ and ‘the field’. It is suggested that participation in these rites of passage is a pre-requisite to become a ‘real’ irrigation engineer.

Chapter 5 discusses the performance of women engineers and ‘other men’ in the Department of Irrigation. Other men are conceptualized as a broad category of men, from professionals with a disciplinary background other than engineering to men of ‘low caste’ and men with a particular ethnic background. The analysis mainly focusses, however, on the performance of ‘lady engineers’ as women engineers in the Department are known. Their marginalized position in the organisation is highly visible whereas subordinated positions of men in the Department are more difficult to detect. Apart from the presence of (male) Madhesi officers in the organisation, class, caste and ethnic issues among men are difficult to understand ‘within’ the Department, because staff with a Dalit background, for instance, constitute only 2% of staff in lower management positions in the organisation. The taboo for women to perform in the field also is discussed in relation to the performance of the lady engineer, and an overview is presented of the disadvantages that lady engineers tend to accumulate in the pursuit of a career in the Department. The analysis reveals that most women engineers come to face a career plateau in their life, causing them to accept office work that is considered of secondary importance, switch job or quit service altogether.

Chapter 6 analyses the performativity of irrigation data and their use in policy making in Nepal. In the recognition that technical representations of reality help to enact professional credibility and claims of truths of irrigation engineers and water professionals, the focus is on understanding how irrigation data might support (and help to enact) professional performances in irrigation. It is analysed how irrigation data breathe life into particular representations of reality, reflecting and structuring a particular experience in irrigation expert thinking. It is suggested that the ‘show’ of irrigation data can also be considered a ‘cultural expression’ of authority, professional identities and masculinities in irrigation. This is not to say that women professionals in irrigation would use and construct irrigation data in a different way, but to point out that authority ‘sticks’ more easily to male engineers when they use irrigation data, than to female engineers when they use irrigation data.

Chapter 7 presents a self-portrait of ‘our knowledges’ in irrigation. Speaking about ‘our knowledges’ in irrigation – something that is deeply contentious from a feminist perspective – is done as a way to acknowledge my subjectivation as an irrigation professional and to invite fellow members of knowledge and policy elites in development to participate in an exercise of self-discovery. I reconstruct a history of irrigation expert thinking in Nepal based on 60 years of state irrigation interventions in Chitwan District (1950-2010). It is an explorative study, rich in empirical material, also presenting a fresh look at irrigation practices in Chitwan before the 1950s and re-constructing an account of how images of the Tennessee Valley

Authority in America served to conceptualize multipurpose watershed management and new irrigation projects in Nepal. Through the use of photos, I also show how engineers have acted as negotiators of knowledge and masculinities in the act of building irrigation systems in Chitwan District. The investigation is based on the assumption that it is worthwhile to scrutinize our expert knowledges in irrigation because our performances and identities of 'ourselves' – as male and female engineers and professionals – are somehow implicated in it. Treating the historical account as a self-referential experience or self-portrait of professional performances in irrigation, I explore how masculinities have been associated with our expert knowledges. The analysis is also treated as an account of professional performance and practices of masculinities that I have negotiated (and performed) myself, in the act of doing research in irrigation on masculinities.

In the last chapter (general discussion and conclusions), I conclude that masculinities are deeply embedded in professional cultures in irrigation – not just in interactions between irrigation engineers and water professionals but also in our knowledges in irrigation. Professional performances and expert knowledges in irrigation are an enactment of 'projectness' – a particular experience of reality (in projects) which reflects and structures 'our' understandings of the world in a gendered way, and in which 'we' hardly have been able to date to accommodate feminist perspectives on irrigation and water management. I also point out that qualifying behaviour or practices of people as (partially) masculine or as an effect of masculinities is controversial among irrigation engineers and water professionals. Irrigation and water management historically is a field of applied engineering, and the argument that masculinities are implicated in professional identities and in irrigation expert knowledge, is disputed. Irrigation engineers and water professionals generally have internalized a conviction that science and engineering is rational and universal, and they propagate the view that engineering itself is disconnected from meanings of masculinity and femininity.

Samenvatting

Dit proefschrift is een verslag van mijn pogingen om mannelijkheid of mannelijkheidsconstructies (*masculinities*) tussen irrigatie-ingenieurs en water-professionals in Nepal te bestuderen. De irrigatie – en waterbeheer wereld is een echte mannenwereld, maar dit wordt nauwelijks erkend, benoemd en bestudeerd, ondanks veel (politieke) aandacht in de afgelopen twintig jaar voor gender ongelijkheid binnen ontwikkelingsbeleid en – onderzoek. Mijn studie is gebaseerd op de waarneming dat er een stilte valt in het debat binnen irrigatie en ontwikkelingssamenwerking zodra het over professionals, mannen en het masculiene subject gaat. De hypothese van de studie is dat er iets intrinsiek mannelijks is aan de professionele cultuur van irrigatie – en waterbeheer, zowel in het Westen als in Nepal. Deze hypothese is gebaseerd op persoonlijke ervaring; ik ben zelf een man en onderzoeker in waterbeheer, en ik ben opgeleid als irrigatie-professional in Nederland. Verder heb ik tijdens mijn studiereizen in India en Nepal irrigatie-ingenieurs en water-professionals ontmoet in een interculturele context. De hypothese is tevens gebaseerd op academische literatuur waarin mannelijkheid en mannelijkheidsconstructies binnen irrigatie ter discussie staat. Het doel van dit proefschrift is het bevragen van een binnen irrigatie veronderstelde en vanzelfsprekende associatie tussen mannen, organisatorische kundigheid, autoriteit en expertise. In het proefschrift wordt de wereld van irrigatie – en waterbeheer ingedeeld in twee denkbeeldige domeinen: het domein van de irrigatie-ingenieur en water-professional, en het domein van professionele expertise en irrigatiekennis. Voor beide domeinen worden verschillende onderzoeksvragen gesteld. Voor het eerste domein: hoe wordt iemand een irrigatie-ingenieur in Nepal, op het Irrigatie-departement, en wat zijn de gedragingen, identiteiten en associaties van mannelijkheid die daarbij komen kijken. Voor het tweede domein: hoe zijn mannelijkheidsconstructies, in de breedste zin van het woord, mogelijkerwijs ingebakken in professionele expertise en irrigatiekennis. Om de eerste vraag te beantwoorden analyseert dit proefschrift de instituten van technisch (ingenieurs-) onderwijs, beroepsverenigingen en toezichthoudende beroeps-organen, en het Irrigatiedepartement. Om de tweede vraag te beantwoorden analyseert dit proefschrift de presentatie en het gebruik van data (cijfers en statistieken) in irrigatiebeleid, en het bestudeert veranderingen in professionele expertise en irrigatiekennis in Nepal.

Het theoretisch raamwerk van het proefschrift is het perspectief dat 'professionele performance' binnen irrigatie begrepen kan worden als culturele performance, alsof irrigatie-ingenieurs en water-professionals acteurs zijn in het maatschappelijke decor, net als in een toneelvoorstelling. Deze voorstelling van professionele performance is geïnspireerd door het werk van de Britse antropoloog Victor Turner. In hoofdstuk 1 leg ik uit dat de metafoor van 'performance' zowel begrepen kan worden als technische performance en als culturele performance, twee zijden van dezelfde munt, elkaar ondersteunend en onlosmakelijk met elkaar verbonden in professionele performance. In het onderzoeksproces ben ik deze theorie gaan zien als zeer toepasselijk voor dit proefschrift. Het heeft mij in staat gesteld om verbindingen te leggen tussen de gender van ingenieurs, professionele beroepsculturen binnen irrigatie en technische representaties van de werkelijkheid in irrigatiekennis, zonder daarbij mijzelf van het analytisch proces uit te sluiten. Dit laatste is belangrijk in onderzoek naar mannelijkheidsconstructies, omdat het identificeren van mannelijkheid en vrouwelijkheid onvermijdelijk een interpretatief, context gebonden en partieel proces is.

Hoofdstuk 2 presenteert voor het proefschrift relevante historische achtergronden van irrigatieontwikkeling in Nepal. De belangrijkste overheidsprojecten in de irrigatie sector in Nepal en de veranderingen in de professionele beroepspraktijk binnen irrigatie worden toegelicht. Ook wordt er een achtergrondanalyse gepresenteerd van het onderwijssysteem en de overheidsdiensten in Nepal (vanaf de jaren 1950). Hierbij gaat de aandacht naar gender aspecten in deze instanties en er wordt gewezen op het feit dat deze (publieke) instanties altijd hebben gefunctioneerd als gesloten instituten voor de hoge klasse en hoge kaste elite in Nepal. Dit hoofdstuk documenteert ook een geschiedenis van vrouwen-professionals binnen de Nepalese plattelandsontwikkeling (vanaf de jaren 1950). Het doel hierbij is om te begrijpen waarom er eigenlijk zo weinig vrouwen als irrigatie-ingenieur werkzaam zijn in Nepal. In deze analyse wordt ook ingegaan op de introductie van sociaal werkers (*social organisers*) in irrigatie, een beleidsmaatregel van de vroege jaren 1990. De vraag is waarom deze ‘sociale’ posities in irrigatie niet door vrouwen-professionals zijn opgepakt. De studie laat zien dat de rol van vrouwen-professionals binnen de Nepalese plattelandsontwikkeling altijd beperkt is geweest. De vrouwen-professional werd geacht zich hoofdzakelijk bezig te houden met ‘vrouwen-kwesties’ vanwege ‘haar’ veronderstelde ‘feminiene kwaliteiten’, en niet met andere of bredere vraagstukken in plattelandsontwikkeling.

Hoofdstuk 3 presenteert een feministische lezing van de geschiedenis van de belangrijkste instanties op het traject om irrigatie-ingenieur te worden in Nepal. Het eerste instituut is het technisch (ingenieurs-) onderwijs. De analyse richt zich hoofdzakelijk op Nepal, maar het benoemt ook de plaatsen in het buitenland (voornamelijk in India) waar Nepalese mannen (en enkele vrouwen) heen zijn gegaan voor hun onderwijs. De analyse richt zich op het zogenaamde diploma-onderwijs (middelbaar beroepsonderwijs, opleiding tot opzichter) en bachelor-onderwijs (hoger beroepsonderwijs, opleiding tot ingenieur) in civiele techniek en landbouwtechniek. Voor deze disciplines heb ik data verzameld van het aantal studenteninschrijvingen aan ingenieurscolleges, en die gesegregeerd naar gender en kaste (vanaf de jaren 1980). Een tweede set van instanties zijn de toezichthoudende beroepsorganen en de beroepsverenigingen voor de professionele sectoren van water, landbouw en irrigatie. Er wordt een analyse gepresenteerd van ongeveer veertig beroepsverenigingen. Ook worden enkele kleine en beginnende beroepsnetwerken van vrouwen-professionals besproken. Het derde instituut is het Irrigatiedepartement. Haar geschiedenis wordt beschreven vanaf 1952, het jaar dat het Departement is opgericht, en er wordt geanalyseerd wie er werkzaam zijn geweest voor het Departement. De studie van de instituten in dit hoofdstuk laat zien dat deze organisaties altijd echte mannenwerelden zijn geweest.

Hoofdstuk 4 richt zich op het informele milieu van het Irrigatiedepartement. Het doel is om te begrijpen hoe een afgestudeerde een 'echte' irrigatie-ingenieur wordt. De analyse is gebaseerd op de aanname dat het verkrijgen van een ingenieursdiploma, het lid worden van een beroepsvereniging en het krijgen van een baan in het Irrigatiedepartement, iemand niet automatisch tot een 'echte' irrigatie-ingenieur maakt. De hypothese is dat junior ingenieurs hiervoor actief moeten deelnemen aan het informele milieu van de instituten waar zij toe behoren, en dat zij handelingscapaciteit (*agency*) en wens of wil moeten ontwikkelen en tonen, alsmede vaardigheden en percepties die 'passen' bij een normatieve en gender-authentieke performance van een 'echte' irrigatie ingenieur. In theorie vindt de ontwikkeling van handelingscapaciteit (*agency*) en wens of wil plaats door twee aparte aan elkaar gerelateerde processen. Deze processen noem ik 'zelf-normalisatie' en 'transitionele performance'. De analyse laat zien dat het informele milieu van het Irrigatiedepartement is doorspekt met sociale stereotypen en culturele normen die gangbaar zijn in de (elite-) maatschappij in Nepal. Deze stereotypen en normen vormen barrières, in het bijzonder voor vrouwen, om een 'echte' ingenieur te worden. In de analyse worden tevens twee fasen in de levens van ingenieurs beschreven, welke gezien kunnen worden als rites de passage of overgangsrituelen om een irrigatie-ingenieur te worden: de opleidingsjaren op het ingenieurs-college en de eerste veldervaring. Er wordt gesteld dat succesvolle deelname aan deze overgangsrituelen een voorvereiste is om een 'echte' irrigatie-ingenieur te worden.

Hoofdstuk 5 bespreekt de professionele performance van vrouwen-ingenieurs en 'andere mannen' in het Irrigatiedepartement. De categorie 'andere mannen' is erg breed, en varieert van mannen met een andere opleidingsachtergrond dan die van ingenieur tot mannen van 'lagere kasten' of met een bepaalde etnische achtergrond. De analyse richt zich echter hoofdzakelijk op de performance van 'lady-ingenieurs' (*lady engineers*), zoals vrouwen-ingenieurs op het Departement bekend staan. Hun gemarginaliseerde positie in de organisatie is goed zichtbaar, terwijl ondergeschikte posities van mannen binnen het Departement moeilijker te ontdekken zijn. Afgezien van de zichtbare aanwezigheid van Madhesi-mannen-ingenieurs, zijn de verschillen tussen mannen naar klasse, kaste en etniciteit binnen het Departement moeilijk te beschouwen. De totale staf met een Dalit-achtergrond omvat bijvoorbeeld minder dan 2% van de organisatie. In verband met de performance van de lady-ingenieur wordt het taboe voor vrouwen om naar het veld te reizen uitvoerig geanalyseerd. Er wordt ook een overzicht gepresenteerd van alle nadelen die vrouwen tegenkomen als zij een carrière als ingenieur in het Departement nastreven. De nadelen hebben een cumulatief effect en de analyse laat zien dat de meeste vrouwen-ingenieurs terecht komen op een ‘carrièreplateau’. Dit uit zich in het aanvaarden van kantoorwerk dat laag in aanzien staat, het veranderen van baan of het nemen van ontslag.

Hoofdstuk 6 analyseert de actieve werking of ‘performativiteit’ van irrigatie-data, en het verzamelen en presenteren daarvan voor irrigatiebeleid in Nepal. De aandacht gaat uit naar het begrijpen hoe de presentatie en het gebruik van data in irrigatiebeleid professionele performances in irrigatie in het leven roepen en ondersteunen. Daarin wordt onderkend dat technische representaties van de werkelijkheid een belangrijke rol spelen in het creëren en ondersteunen van professionele autoriteit. De analyse laat zien hoe de presentatie en het gebruik van irrigatie-statistieken (nieuw) leven blazen in bepaalde interpretaties van de werkelijkheid, en dat de representaties daarvan een specifieke ‘werkelijkheid’ of ‘ervaring’ bespiegelen en structuren binnen professionele expertise en irrigatiekennis. Er wordt getoond dat de presentatie en het gebruik van irrigatie-data ook gezien kan worden als een culturele expressie (‘een show’) van autoriteit, professionele identiteiten en mannelijkheidsconstructies binnen irrigatie. Dit is niet hetzelfde als beweren dat vrouwen-irrigatie-professionals data en statistieken op een andere manier (zouden) gebruiken; het betekent dat autoriteit makkelijker ‘vastplakt’ aan mannen-ingenieurs dan aan vrouwen-ingenieurs wanneer data en statistieken gepresenteerd en gebruikt worden in het maken van irrigatiebeleid.

Hoofdstuk 7 presenteert een zelfportret van ‘onze kennis’ binnen irrigatie. Spreken over ‘onze kennis’ binnen irrigatie is iets wat feministische denkers onmogelijk achten en waar zij tegen ageren. Ik doe het echter om mijn eigen oogkleppen en (ver)vorming (*subjectivation*) als irrigatie-professional te erkennen en om collega-professionals en andere experts in ontwikkelingssamenwerking uit te nodigen voor een oefening in zelf-ontdekking. Het hoofdstuk reconstrueert een geschiedenis van irrigatiekennis in Nepal gebaseerd op zestig jaar overheidsinterventies in het district Chitwan (1950-2010). Het is een exploratieve studie, rijk aan empirisch materiaal. Dit hoofdstuk presenteert ook een nieuwe blik op de beoefening van irrigatie in Chitwan van vóór 1950, en het documenteert hoe het ideaalbeeld van de Tennessee Valley Authority in Amerika diende als inspiratiebron voor multifunctionele stroomgebieds-ontwikkeling en nieuwe irrigatie-projecten in Nepal. Mede door het gebruik van foto’s laat ik zien hoe ingenieurs en andere professionals hebben gefunctioneerd als doorgeefluik en onderhandelaars van kennis en mannelijkheid tijdens het bouwen van irrigatie-systemen in het district Chitwan. De studie is gebaseerd op de aanname dat het de moeite waard is om onze kennis en expertise binnen irrigatie te onderwerpen aan kritische reflectie omdat onze performances als professionals, onze identiteiten als mannen- en vrouwen-ingenieurs, en onze manier van denken over irrigatieontwikkeling, op één of andere manier een associatie hebben met mannelijkheid. Door de geschiedenis te behandelen als een zelf-referentiële ervaring of zelfportret van professionele performance in irrigatie, probeer ik te ontdekken hoe mannelijkheid geassocieerd is geraakt met onze kennis van irrigatie. De analyse is tevens een verslag van mijn eigen professionele performance en een voorbeeld van een mannelijkheidsconstructie binnen irrigatie die ik zelf heb beoefend en bevraagd tijdens het doen van onderzoek.

In het laatste hoofdstuk (algemene discussie en conclusies) concludeer ik dat identiteiten, gedragingen en expressies van mannelijkheid diep ingebakken zijn in de beroepscultuur binnen irrigatie – niet alleen als omgangsvormen in interacties tussen irrigatie-ingenieurs en water-professionals maar ook in 'onze kennis' binnen irrigatie. Professionele performances in irrigatie en expertise binnen waterbeheer zijn onderhevig aan 'projectigheid' (*projectness*) – een specifieke ervaring van de realiteit (in projecten) die ons begrip van de wereld bespiegeld en structureert op een manier die sterke mannelijke connotaties heeft en waarin 'wij', tot op heden, niet in staat zijn geweest om alternatieve feministische perspectieven op irrigatie en waterbeheer te waarderen. Tevens wijs ik erop dat het kwalificeren van gedrag en acties van mensen als (gedeeltelijk) mannelijk of als een effect van mannelijkheidsconstructies, zeer controversieel is onder irrigatie-ingenieurs en water-professionals. Historisch gezien zijn irrigatie en waterbeheer een beroepenveld van toegepaste techniek, en het argument dat 'masculiniteiten' sterke associaties hebben met professionele identiteiten en zelfs met irrigatiekennis, wordt doorgaans verworpen. Irrigatie-ingenieurs en water-professionals hebben een overtuiging geïnternaliseerd dat wetenschap en techniek rationeel en universeel zijn, en zij verkondigen een wereldbeeld waarin techniek zelf los staat van de betekenissen van mannelijkheid en vrouwelijkheid.

Curriculum Vitae

Janwillem Liebrand was born in Nijmegen, the Netherlands on 19 November 1979. After travelling and working in Australia and New Zealand for one year, he started his studies in 1999 on Tropical Land Use (*Tropisch landgebruik*, now International Land and Water Management) at Wageningen University. As part of his studies, he did an internship (2002-2003) in Gujarat, India at the IWMI-TATA Water Policy Programme of the International Water Management Institute (IWMI). During his internship, he developed an interest for anthropology and professional cultures in irrigation, and for gender aspects of water management. He did a small research on evolving water users' institutions in the service area of the Sardar Sarover Irrigation Project, and also one on the introduction of water saving technology (drip irrigation) in Banaskantha District (North-Gujarat) and its implications for farm households from a gender perspective. In 2004, he did a first thesis research in the Philippines, with the Institute of Popular Democracy (IPD). This NGO studied drinking water privatization in the Philippines; it campaigned against it and Janwillem investigated a water privatization conflict in Calapan City (Mindoro Island). In 2006, he did a second thesis research in Limpopo Province, South Africa, returning to IWMI. Here, he focussed on white commercial farmers and how they anticipated land and water reforms of the new post-Apartheid government, based on the idea that these farmers needed to cooperate if reforms in South Africa had to produce change. During his studies, Dr. Margreet Zwarteveen acted as his internship and MSc thesis supervisor. Janwillem graduated in 2007.

After some small teaching assistance jobs at the Irrigation and Water Engineering Group (now Water Resources Management Group) of Wageningen University, he obtained a position as junior researcher and lecturer at this group and he was given the assignment to develop a research proposal on men and masculinities in irrigation, under supervision of Dr. Margreet Zwarteveen. Funding was awarded by Wageningen University and in 2008, he started his PhD research. He followed additional courses on feminist theory and he based himself in Kathmandu, Nepal in the period 2009-2011 to conduct research. Late 2011, he returned to the Netherlands to write his PhD thesis.

He has written various publications on his work, organised PhD courses on action research and has been involved in student supervision and in teaching in various courses of the Irrigation and Water Engineering Group. Janwillem also is currently a board member of the Agromisa Foundation, a Wageningen-based NGO that aims to support small-scale farmers and users' organisations in the South by providing them with practical information on sustainable agriculture.

WASS Training and supervision plan

Janwillem Liebrand
Completed Training and Supervision Plan
Wageningen School of Social Sciences (WASS)

Name of the learning activity	**Department/Institute**	**Year**	**ECTS (1=28hrs)**
A) Project related competences			
NOISE Summer school: 'In between understanding and practicing gender: intersectionality and interdisciplinarity'	Utrecht University	2008	9.0
B) General research related competences			
Experiment! PhD Course	CERES/MGS	2009	1.5
ARALIG PhD course: 'Social learning in Nature-Society relations'	NRML Research school, Sweden	2009	4.0
ARALIG PhD course: 'Challenges of sustainability and climate change'	NRML Research school, Sweden	2010	4.0
'Struggling to perform: Analysing masculinities and professional cultures among men and women irrigation engineers in Nepal'	WASS PhD day	2012	1.0
'Masculine performances and good projects: Reflections on interviews with/between engineers in Nepal'	NOG (Netherlands Research school for Gender studies)	2012	1.0
C) Career related competences/personal development			
Basic Course Didactical Skills	WUR	2008	3.0
'Debating the water professional of tomorrow' (Co)organized workshop	NETHCID/WUR	2008	1.0
Sustainable Development Diplomacy	SCF Foundation, TiasNimbas Business School	2012	2.0
Course Journalism for Science (Wetenschapsjournalistiek)	SCW Foundation, Amsterdam	2013	4.0
(Co)supervision of 5 BSc thesis and 7 MSc thesis	IWE/NEC/Utrecht University	2013	4.0
Total			**34.5**

The research described in this thesis was financially supported by Wageningen University through the IPOP theme Scaling and Governance.

Financial support from Wageningen University for printing this thesis is also gratefully acknowledged.

Lay out and cover design: Janwillem Liebrand
Printed and lay out cover: Gildeprint Drukkerijen – The Netherlands
Photos front cover: Main canal of Chitwan Irrigation Project, 1978 (top photo). Visit of Minister of Irrigation in Chitwan and local representatives, 2008 (bottom photo). Photos provided by officers of the Department of Irrigation, Nepal.
Photos back cover: Archive photo of batch of students of University of Roorkee, 1983 (top photo); Map of Chitwan Valley Development Project, 1972 (second from the top); Engineers of the Department of Irrigation, 1994 (third from the top); Interaction between overseer and researcher in Chitwan at an irrigation project, 2010 (bottom photo). Photos provided by officers of the Department of Irrigation.