Working towards SEAN-ERA
A framework and principles for integrating environmental sustainability into planning

Jan Joost Kessler

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Correspondence on this particular volume:

Wageningen University and Research Centre, Department of Environmental Sciences
Erosion and Soil & Water Conservation Group
Nieuwe Kanaal 11
6709 PA Wageningen
The Netherlands
Tel: +31 (0)317 484190
Fax: +31 (0)317 486103
jolanda.hendriks@wur.nl
http://www.dow.wau.nl/essw/

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Pour toute correspondance au sujet de la présente publication, s'adresser à:

Wageningen Université et Centre de Recherche, Département des Sciences de l'Environnement
Groupe d'Erosion et de Conservation des Eaux et des Sols
Nieuwe Kanaal 11
6709 PA Wageningen
Pays-Bas
Tel: +31 (0)317 484190
Fax: +31 (0)317 486103
jolanda.hendriks@wur.nl
http://www.dow.wau.nl/essw/
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Jan Joost Kessler

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Evert van der Molen

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SUMMARY

SAMENVATTING

ABOUT THE AUTHOR
ACKNOWLEDGEMENTS

This book contains the thesis to obtain the degree of Doctor at the University of Nijmegen. This thesis has gradually emerged from the various subjects of my professional career. None of the studies and experiences that I used for writing this book was deliberately set up as experiments to work out well-defined hypotheses. The work that I have done was mostly the object of paid assignments and concrete demands, usually from a development organisation working in a southern country. At a certain moment I felt a desire to look back and synthesise my experiences, completed by literature reviews, work by colleagues and discussions in Academia. I am satisfied that this book covers a broad field including most of the subjects that I have so far been involved in.

This book could never have been written without the inputs of many colleagues, partners and participants both in the Netherlands and in various developing countries. They helped test, apply, discuss, improve and further develop guidelines on integrating environmental issues into development plans, which at some stage were structured as the Strategic Environmental Analysis (SEAN) method. I enjoyed working with these various committed persons, and am grateful for their openness and advice.

I want to mention in particular Cyriaque Adjinacou, in Benin, who has been involved in all applications of SEAN in Benin and other West African countries, and greatly helped shape and improve this method. I much respect his communication capacities which are so essential to run a good planning process. Within SNV, I want to mention in particular Albert Heringa, who has been co-founder of the SEAN method. I will always remember the long discussions on ecological concepts and ways of putting these into operation. At various occasions he convinced me that short-cuts could not be made without compromising on the process or the contents. Another co-founder is Franke Toornstra, who first introduced me to the problem-in-context method, which was gradually adjusted to become an important element of the SEAN method. Later he moved to the DGIS and has been very helpful in finding suitable situations to apply the SEAN method for different purposes, but he has also continued to give useful advice and comments on its contents.

I enjoyed the collaboration with so many other local colleagues and staff from SNV and other development organisations who applied the method in different countries under various conditions, or participated in trainings and field visits. Their experiences and feedback allowed the method to further develop and be adjusted to different contexts, and allowed me to learn from practice. I look back at this period as one of continuously trying to find the right balance between theory and practice. In particular should be mentioned Honduras and Nicaragua, where I have never been myself. Here work with SEAN was started by Tonnie Tekelenburg, on a voluntary basis, and was subsequently expanded and improved by SNV in collaboration with local partners, such as Fundación Vida. I much appreciated the excellent working relationships with SNV staff including Rob Ukkerman, Petrie van Gent and Martha Klein, which has contributed to an impressive number of applications as well as educational materials.

Others again were particularly helpful in expanding and promoting the method, allowing others to make use of it. Here I want to mention in particular Han Baartmans from SNV. Support was also received from the DGIS, for instance through training, the set-up of a SEAN web-site, the writing of newsletters and the production of a CD Rom with training materials. I want to mention in particular the pleasant collaboration with Anneke Wevers and Henk van Trigt.

My work as a consultant started in 1994 with Matrix Consultants in Utrecht. The stimulating working relations with Margreet Moolhuijzen and Regine van de Sijp lead to the first ideas of developing some sort of sustainability planning framework.
Work as a consultant continued with the non-profit foundation AIDEnvironment in Amsterdam. At first I did not realise this would be the place where I would stay so long, after moving around between so many countries and jobs. For me, AIDEnvironment provides the right balance between personal freedom, organisational support and a stimulating atmosphere. Many colleagues at AIDEnvironment have helped shape my thinking and thus contributed much to this book, which they will certainly recognise. To all of them, I am grateful for the friendship, openness, advice and contribution to the good atmosphere in which I enjoy working.

I want to mention in particular certain persons. Marjon Reiziger, for her stimulating role, the successful promotion and networking, and her enthusiasm to develop, together with Ab Bol the designer, the impressive SEAN Toolbox. Bart Romijn, for his very useful and pragmatic views, our fruitful discussions and pleasant joint missions and efforts to improve environmental management within organisations and institutions. Jeroen van Wetten, who emphasised the need for an opportunity-oriented component within SEAN, Erik Wakker, whom I much respect for his activist approach and analytical insight in global trade dynamics, and José Joordens with whom I had several discussions on ecological concepts and who gave useful comments on chapter 2 of this book. These ideas have somehow also been incorporated in this book.

The idea to write a thesis was first raised as early as 1986 by the late Dik Thalen, on the basis of my work in the Yemen Arab Republic. I then decided first to broaden my experience, and did so by my work for the Wageningen Agricultural University in Burkina Faso at the Antenne Sahélienne. I much appreciated the collaboration with Chris Geerling and Leo Stroosnijder, as well as the support by Erik Frederiks. I subsequently worked some years at the Forestry Department of this University, mainly to support work executed by students at the Antenne, and enjoyed working with Freerk Wiersum and Maja Slingerland. In particular I also want to mention Henk Breman, with whom I undertook the ambitious task to write a scientific book on the role of woody plants in semi-arid regions. Unfortunately, our well founded but critical views on agroforestry were not appreciated by everyone.

At that time I undertook a first attempt to write a thesis under guidance of Len ’t Mannetje and Niels Röling. But ideas had not sufficiently matured. It was only after I contacted Wouter de Groot in 2000 that I received the right type of stimulus to be able to finalise this undertaking. I will remember the debates and pages full of written comments which constituted a welcome academic debate that I missed in the consultancy world. We were both surprised to find out that independently we arrived at the conclusion that there is need to better understand ‘human nature’ as a fundament for a more sustainable society.

I spent much time working on this book (weekends, evenings, holidays), apart from a full time job as consultant. I want to thank in particular my wife Annemarie who has always stimulated me to do this and never complained about this private project.
1. INTRODUCTION

1.1 A PERSONAL VISION

I will first present my vision about a more sustainable future, for a fictitious locality that may be found anywhere in the world. This vision not only stimulated me to write this book, but also leads to the book’s main objective, which is the development of a framework and principles to integrate environmental sustainability into regional planning. The title of this book refers to the name of this framework: SEAN-ERA which stands for Strategic Environmental Analysis by using Emotions, Rationality and early Actions drivers.

A vision is rooted in a certain perception of the current situation. So that is what I will describe first: my perception of the current situation with respect to the subject of this book.

The current situation - problems

My opinion is that at the moment, throughout the world, environmental sustainability issues are not well taken into account. More specifically, what is wrong?

- Environmental issues are treated as an ‘add-on’ and sector apart, rather than being integrated in sectoral policies, and are dealt with in a reactive instead of a pro-active way;
- A utilitarian and economistic view of ‘the environment’ predominates, neglecting the non-material, cultural, social and ethical values of the environment;
- Environmental standards are either absent, or are not respected, or are subject to cost-benefit analyses, thus neglecting critical thresholds for highly valued environmental goods and services;
- Global environmental concerns are not adequately addressed at local levels;
- Western consumers and producers are not aware of, or do not take into account the trade-off of their behaviour to other parts of the world and to future generations;
- Planning processes are not sufficiently open, especially not for the ‘big issues’, nor are the methods adequate to deal with complex systems such as environment – development interactions;
- The victims of environmental degradation (e.g. in the South) do not have a real voice in planning processes and neither are their concerns well represented;
- There is no long-term and large-scale vision of what sustainable development and environmental sustainability for a certain locality really implies, the emphasis is on short-term benefits;
- In the Western world, insufficient confidence and motivation exists to manage environmental and related social problems through self-organisation and self-regulation.

The current situation - opportunities

There are also opportunities, which constitute potentially useful starting points for positive changes to occur if adequately supported and stimulated. Let me mention some:

- Local development initiatives that come forward from a strong desire to manage one’s own cultural and natural heritage and protect these against external damaging forces;
- People taking the initiative to address problems of illegal resource exploitation, violation of human rights with respect to access and control over resources;
- The development of global networks to counter the negative forces of globalisation, linking by internet local groups from all over the world to address urgent matters;
- A gradually growing willingness of consumers to pay for fair trade (social equity) and for ecological products;
• The increasing receptiveness of the private sector to adopt environmentally sound policies, not only because clean technology pays back;
• A renewed interest by people in the spiritual and immaterial values of nature, based on the recognition that these values contribute to physical and mental well-being (biophilia);
• People taking time to gain understanding of their own self and intuitions, why they behave as they do, and explore human nature and what makes human beings unique.

A vision of the future
From above I can see a landscape with villages, a town, industry, roads, forests, agricultural fields, water. I can see people moving around. They feel proud of their locality, they can tell you why their locality is special for them, why they like to live there, and also how this locality and the way it is being managed contributes to well-being of people and nature beyond this locality. They can show the products that are regionally produced and transformed in industries for local consumption and for export. I can see well managed historical sites, cultural heritage and nature sites. There are different kinds of local and regional organisational arrangements, with everyone a role to play and capable to do that. This does not mean that everything is static and always peaceful, there are also tensions and conflicts, and changes taking place all the time. Diversity is considered a wealth, and not a threat. The people have a vision with well-defined bottom-line standards and principles about how to manage their locality.

Once every year there is a big event to discuss progress and plan new activities. Everyone can participate or is represented. Included are some key actors from outside the locality representing supra-local values, interests, policies and conventions, and representatives from the private sector, considered by the locality as strategic partners. The event is well-structured, which allows everyone to gain insight in the complex relations between development and environment, and to set priorities by using clear criteria. Use is made of social and environmental ‘state of the art’ reports, monitoring reports and lessons learned from past interventions, prepared by the people themselves. The event is supported by a number of professional facilitators, mediating conflicts, ensuring that all voices are heard, and assuring transparency. These insights lead to the culmination of the annual event, which is the review of the vision (are we on track?), the review and definition of new social and environmental bottom-line standards (are these respected?), and the signing of new agreements (e.g. convenants or co-management arrangements). This annual event is rounded off by a great celebration.

Objectives to realise the vision
I have written this book to contribute to bridging the gap between the current situation and the vision of the future, i.e. to tackle the current problems by stimulating and strengthening existing opportunities. I hope to achieve this through the following two objectives.

1. To develop a framework to support stakeholders in integrating environmental sustainability issues into regional planning, including the definition of institutional requirements
2. To develop guidelines to facilitate the planning process, in line with criteria of sound decision-making and good governance.

The above vision can be considered as the problem statement of this book, justified by my perception of the current situation.
1.2 METHODOLOGICAL BACKGROUND

As an ecologist I first worked as a technical assistant in two developing countries (Yemen Arab Republic and Burkina Faso) before I became a consultant in the field of environmental attention within development aid programmes and projects. This is often a frustrating job, because in most cases there is only attention for environmental issues at a late stage of planning or implementation, so that the best one can do is propose some mitigating or compensating measures to reduce negative environmental impacts. The assignments I got involved in often had a rather ad hoc character, and one rarely had the chance of knowing exactly what was done with conclusions and recommendations.

With SNV (the Netherlands Development Organisation) I developed the Strategic Environmental Analysis (SEAN) methodology to take into account environmental issues at an early stage of planning at regional or country level. The method has by now been applied at least 30 times in various countries, at different intensities, at different levels and for different owners. There appears to be a demand for strategic integrated planning, as a basis for operational planning. Although there is much discussion about a holistic vision and an integrated development strategy, there are few practical methods and tools that can help one develop these.

Working with SEAN was very interesting. But I gradually discovered that developing a long-term vision, working out a long-term strategy and maintaining this focus for identifying actions, or setting up a monitoring system, are not very popular subjects. It doesn’t lead to quick results, it doesn’t give visible outputs, it doesn’t help generate funds, it is difficult to organise, it includes a lot of debate about abstract concepts, and it is generally not rewarded. Yet, commonly conferences or policy reviews dealing with sustainable development issues come to the conclusion that these are the things that are missing and that should be done. In brief, many people find strategic integrated planning and environmental sustainability important to address, but these wishes are not often operationalised.

This was one of my motivations to thoroughly analyse the subject, from environmental sustainability to environmental management systems, from local knowledge to ecological research on carrying capacity, from local-level planning tools to environmental assessment of macro-economic policies, from local organisations to environmental governance, etcetera. My aim was not to further expand the method, but on the contrary to contract the method to acquire a minimum set of principles and guidelines. To do so, I initiated a range of activities, such as an electronic conference, various workshops in developing countries, and backstopping activities to evaluate experiences and determine success factors. These have been important inputs to this book.

Apart from the numerous SEAN experiences, inputs to this book have been my experiences in working out a conceptual framework for environmental governance and guidelines for the analysis of environmental management institutions. Other relevant work has been in the field of environmental monitoring and evaluation, strategic environmental assessment and integrated assessment, e.g. of structural adjustment programmes.

None of the studies and experiences that I used for writing this book was deliberately set up as experiments to work out well-defined hypotheses. The work that I have done was mostly the object of paid assignments and concrete demands, usually from a development organisation working in a Southern country. So there is no explicit research set-up associated with this book, but much of the work that I have undertaken did follow an implicit pattern of initiating applications, monitoring these and then improving the approach based on lessons learned. At a certain moment, after 5 years of technical assistance and 10 years of consultancy work, I felt a desire to look back and synthesise my experiences, completed by literature reviews, work by colleagues and discussions in Academia. I am satisfied that this book covers a broad field including most of the subjects that I have been involved in.
1.3 STRUCTURE OF THIS BOOK

This book has a logical structure. Chapters 2 to 6 present reviews of concepts, cases, experiences, methods and tools to generate building blocks for meeting the two objectives of this book: developing a framework and principles for integrating environmental sustainability into regional planning, which will be presented in Chapter 7.

In Chapter 2, I review socio-ecological concepts, such as the environment, environmental sustainability, stability and resilience, sustainable development, the Problem-in-Context model and adaptive management. My aim was mainly to work out these concepts into concrete operational terms. One concept developed in this chapter is ‘guided adaptive management’, which is adaptive management within the bounds of standards to be respected and oriented towards a long-term vision, to give direction to the process of change.

In Chapter 3, I work out patterns and states of land-use dynamics. This chapter is based on empirical evidence summarised in Annex I, constituting most of my own studies and research assignments. From these studies I develop the so-called two-pronged analytical approach, including one prong of situational analysis, and one prong of macro-level analysis. These two prongs together form the analytical basis of my framework. For the macro-level analysis I work out seven typical states of land-use dynamics, applicable to any country or region in the world. These states will be helpful to determine where one is at the moment and what structural changes one may expect in the future. Anticipating on these macro-changes within a local context is what strategic planning is about.

All this work of analysis, design and implementation will have to be carried out by institutions and by decision-making processes, which is the focus of Chapter 4. If institutions fail, no matter how well planned, environmental management will not take off. Therefore, we need insights in the institutions responsible for implementing the plans, how they function, how they are structured and how decision-making takes place. In Chapter 4, after having developed insight in how institutions operate, I develop a framework for the analysis of institutions dealing with environmental management. This framework links the environmental management structure, in its institutional context, with the environmental management process, in its governance context, and aims to identify the main gaps and opportunities for change.

In Chapter 5, I review existing tools and methods for planning and design. From the vast field of available methods, a selection has been made by the following categories: environmental assessment methods, trends in environmental planning and design and three development and design models with case studies. Concrete methods and tools include Strategic Environmental Assessment (SEA), integrated assessment, negotiation, communication and learning tools, participatory land-use planning, co-management and integrated environmental management. A range of system-analytical as well as process-analytical and learning tools and methods are involved. It is concluded that these methods and approaches all have reached some success, but still face major difficulties to help solve complex environmental problems and assure that environmental bottom-line standards are properly defined and respected.

Strategic Environmental Analysis (SEAN) is a method for strategic planning that I developed with SNV to integrate environmental issues into planning processes. In Chapter 6 this method is introduced, experiences reviewed, and lessons and conclusions drawn with respect to the substantive results and planning process. While many tools and methods developed for SEAN are useful, it remains a challenge to simplify the framework to make it more widely applicable. In this chapter I also review experiences of the Action Network of WWF, an innovation initiative in which I became involved as a reviewer. The approach developed by this programme is interesting because in some ways it is opposite to the SEAN methodology.
In Chapter 7, building blocks from previous chapters are brought together to form a new framework and principles for ‘sustainability planning’. First of all, I introduce the ‘ERA drivers’ as a new unifying concept. The three ERA drivers are the Emotional / intuition driver, the Rational / system-analytical driver, and the early Actions driver, all of which fuel use of the framework and the planning process. The framework includes eight tasks to deal with the substance of how to integrate environmental issues into a planning process. The tasks focus on the relations between development and environmental sustainability, a location-specific vision and strategy, and the short and long-term institutional requirements to implement this strategy. A set of principles and guidelines should ensure that the planning process meets criteria of sound decision-making, thus contributing to generate mutual understanding and trust, commitment to apply the resulting strategy, networking and partnerships, and other ‘human’ results for implementation of the planned activities. These are important requirements to sustain the process. The last section deals with different aspects of connectedness of people, with their social surroundings, with outside nature, and with their inner nature, as a foundation to develop and nourish inner human senses which are supportive to long-term sustainability. This last section has a more exploratory character.

1.4 A GUIDE FOR THE READER

The resulting framework and principles are generic, meaning that they are applicable to any locality in the world, in spite of the fact that most experiences are from rural settings in developing countries. The focus is at the regional level, for strategic reasons and because of current demand, but the framework is scale-independent. However, there will be a need to work out the framework and principles into an operational manual and guidelines for different cultural settings and development contexts.

Finally, here is some reading advice. Most people will read the summary, and then move on to Chapter 7 which is the resulting framework with principles and guidelines for integrating sustainability issues into planning processes. Depending upon one’s own background and interests, one may then move back to the preceding chapters to find out where the building blocks came from, how these were developed and how these look like in more detail. All the chapters and many sections have conclusions. My personal reading strategy would be to go through these preceding chapters by mainly looking at the figures and tables, many of which have a story to tell. The Annex I contains a wealth of studies and reviews, on rangeland management, low external input technologies, forest conversion processes and the role of financial institutions, agricultural intensification, structural adjustment programmes, and more.

I would be the last person to say that the framework, principles and guidelines presented in Chapter 7 are final. Their practical implementation will need to prove whether it works. You are most welcome to send me any reactions, comments or experiences about application of this material. Write to Kessler@aidenvironment.org.
2. SOCIO-ECOLOGICAL CONCEPTS AND BUILDING BLOCKS

In this chapter I will introduce and define a number of ecological and sociological concepts from which I will derive building blocks for the aim of this book, developing a framework to integrate environmental sustainability issues into planning processes. Also, since many of these concepts are frequently used it should be clear how I define these concepts, as elaborated in the following sections.

Section 2.1: The environment
Here I will make clear that ‘the environment’ should be interpreted as a set of environmental functions, which represent various economic and non-economic values for society. The values of nature and its interpretation is also discussed.

Section 2.2: Environmental sustainability
It is important to define what environmental sustainability implies and how it can be made operational. Basically, sustainability has to do with the maintenance of resilience of ecosystems over long periods, to adapt to changing conditions without loss of functional procurement. I will define a set of operational guidelines for environmental sustainability.

Section 2.3: Sustainable development
Here I will look at how environmental sustainability interacts with socio-economic development, in two ways: realising environmental opportunities for socio-economic development, and avoiding unacceptable environmental change. Striking this balance is the core of sustainable development. It also leads to resilience of human management institutions, to satisfy needs of current and future generations under changing conditions. I will develop insights to operationalise this concept.

Section 2.4: The Problem-in-Context model
The problem-in-context model inspired me to understand the linkages between the biophysical environment and human society. I will explain how the model can be applied as a process of progressive contextualisation to explain environmental problems by identifying contextual factors and the actors involved. This pragmatic and action-oriented approach can be associated with a systems analysis on selected key issues and causal chains.

Section 2.5: Adaptive management
Adaptive management is an approach to deal with complex systems, including many ecosystems and their interactions with human society. I will introduce the concept of ‘guided adaptive management’ as an approach to manage complex systems with a clear direction and within certain (social and environmental) sustainability limits.

Section 2.6: Conclusions
## 2.1 THE ENVIRONMENT

### 2.1.1 DEFINING ENVIRONMENT AND NATURE

The word ‘environment’ has caused definitional problems since time immemorial. It can however, most simply be interpreted as everything non-human around us to which we somehow relate, and that is somehow valued. Nature is generally considered as that part of the environment that is relatively little affected by human beings, with relatively intact biodiversity and biophysical processes (there is no place left that is not affected at all). It then seems more appropriate to talk about the ‘degree of naturalness’ (De Groot, 1992). Possible definitions for naturalness are:

1. The absence of human interference. This would imply that every local inhabitant can be considered an undesirable threat to an area which has been defined as a ‘natural area’.
2. Human interference within natural dynamics. This would imply that people are compatible with nature as long as they behave in a natural way and occur in natural densities, thus having limited impacts on the biophysical system, similar to other large mammals.
3. The maintenance of ecological self-regulating capabilities. This might imply that human influence is acceptable as undesirable environmental impacts can be attenuated or compensated. This requires a definition of undesirable impacts, irreversibility, etc.

I prefer the second definition. It refers to human beings as a natural species, being part of nature, having natural characteristics and natural behaviour. The other two definitions are based on a dualism between nature and human beings, which opens the door towards various types of confusion and misuse, by placing human beings above (or under) other natural species.

Natural behaviour, as part of the second definition, could be defined as behaviour that is intuitive, autonomous, self-regulating. Self-regulation is a general characteristic of natural organisms and systems. It includes, for instance, spontaneous reactions, physical exercise and resource-use, basic activities to reproduce and survive. Thus, the degree of naturalness can be defined at systems level as ‘natural interference’ and at individual level as ‘self-regulating’ properties.

### 2.1.2 ENVIRONMENTAL FUNCTIONS

Considering the environment as a set of natural resources and material products contains a bias towards evaluating the environment in direct economic values. The environment also includes biophysical (ecological) processes and non-material values, e.g. aesthetic and cultural values. The environment can also be defined as the life support system: “the ecological system that sustains the productive, adaptive and regeneration capacities of the land, waters and the entire biosphere” (IUCN, 1991). The term ecosystem refers to a specific set of species and populations in a spatially defined area, the interactions between them and with the biophysical conditions. Well functioning ecosystems are fundamental for human development. For practical reasons I distinguish ecosystems and human society, but the two components are intricately related as indicated in Figure 2.1.
Defining environmental functions is useful to capture the multiple interactions between ecosystems and human society (multiple functions and multiple users). Environmental functions can be defined as the different ways in which the environment contributes to human life. There are different classifications of environmental functions. Based on my own experiences and the classification of De Groot (1992), I would opt for two levels of environmental functions. Within these levels there is no overlap of functions, but between the two levels there is.

At the first level we can distinguish:

1. **Production functions**, which refer to the ability of the environment to generate useful products. Natural or primary production functions are products that the environment produces on its own, they can be harvested, and might be renewable (e.g. firewood, fodder, water) or unrenewable (e.g. oil, minerals). Nature-based, joint or secondary production functions are products that involve management by people to generate more useful products (e.g. agricultural crops).

2. **Carrier functions**, which refer to space or substrate provided by the environment with a suitability to support certain human activities (e.g. waterways for navigation or space for urban settlements).

3. **Habitat functions**, which refer to space and products available for other species, ecosystems and natural processes (‘habitat for nature’).

4. **Enrichment (or cultural) functions**, which refer to non-material socio-cultural values ascribed to the environment, such as aesthetic, spiritual, historic, cultural, scientific and educational values. These functions refer to a meaning (significance) attributed to or discovered in the environment.

At the second level we can distinguish:

5. **Regulation and processing functions**, which refer to processes that maintain the capacity of the environment to provide products. Regulation functions include regeneration, restoration and buffering processes (e.g. soil protection against erosion), processing functions provide protection of nature (e.g. the ozone layer) and reduce harm caused by humans (e.g. dilution of pollutants).

Many people have difficulties to think in terms of functions provided by the environment. For instance, they consider an agricultural crop as an environmental product, and not the nutrients, water etc. provided by the environment to generate crops. Secondly, priority is usually given to environmental products with direct economic value, while signification, habitat or regulation processes (with indirect economic values) are neglected.

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1. The simplest is a classification of environmental goods (tangible products) and services (Barbier et al., 1994).
2.1.3 ECONOMIC VALUES OF THE ENVIRONMENT

Environmental functions are economic goods if they correspond to human needs and desires. They can be mutually exclusive or competitive. For instance, the use of water for irrigation reduces water use for wetland habitat, space taken for agriculture reduces space for nature. Scarce goods get increasing value according to economic theory. Environmental functions that are still not recognised, but which may have a value in the future, are referred to as optional values. This leads to a classification of economic values attached to environmental functions (Perrings, 1995):

1. Production value (direct use), products such as fish, oil, timber
2. Service value (indirect use), services such as climate regulation, flood protection, erosion control
3. Option value (future direct and indirect use), such as undiscovered medicinal products
4. Bequest value (non-use), such as intact ecosystems
5. Intrinsic value (non-use), such as the enjoyment that ecosystems exist

Total economic value is the sum of these categories. Optional and non-use values are difficult to establish in monetary terms. These typically have a public good character, for which no market prices are available, contrary to private goods. The distinction between private and public goods is difficult because environmental functions are increasingly accounted for in cost-benefit analyses, not only in economic terms (costs to society), but also in financial terms (costs to the individual user / polluter).

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2 Public goods are goods and services available to all with two characteristics. First, their use has a low subtractability (non-competing consumption): their use by one person does not prevent the others from using them. Second, they are non-excludable: nobody can be excluded from using them. Non-excludability and non-subtractability mean that no market can exist and provision must be made by government. However, in most cases some exclusion is possible and consumption is not completely non-competing, and thus one can speak of mixed or ‘impure’ public goods (Kessler et al., 2000).
2.2 ENVIRONMENTAL SUSTAINABILITY

In this section I will first discuss some ecological concepts, which will then be used as a basis to elaborate guidelines for assessing environmental sustainability.

2.2.1 STABILITY AND RESILIENCE

Natural ecosystems are characterised by dynamic equilibria in terms of the transfer-cycles of resources, such as water, gasses, energy, nutrients and organisms. Ecosystems do not have a goal, such as the conservation of species diversity, but produce, transform and transport energy and materials (Schultze and Mooney, 1994). Most ecosystems show fluctuations in space and in time, e.g. in terms of species abundance and productivity. They are also self-regulating systems, which implies the existence of control mechanisms to maintain stability (‘reduce errors’) over a range of perturbations. These mechanisms operate through the regulation and processing functions (section 2.1.2). However, the capacity to self-regulate is finite. When levels of pressure approach a threshold, the ecosystem may suddenly collapse. As a result, ecosystem changes may be linear within a certain trajectory of pressures, but move through multiple stable states with transitions and thresholds in between. This refers to a ‘state and transition’ model, which was first demonstrated for rangeland vegetation dynamics (Westoby et al., 1989). Different ecosystem states are characterised by different structure and behaviour.

Recent studies have provided a strong case for the existence of alternative stability domains in various important ecosystems (Scheffer et al., 2001). For certain environmental conditions, the ecosystem has two alternative stable states, separated by an unstable equilibrium that marks the border between the ‘basins of attraction’. When conditions change, these ecosystems may show a ‘catastrophic’ transition or forward flip to another state (Fig. 2.2).

Figure 2.2: States and transitions of ecosystems with multiple stable states (based on Scheffer et al., 2001)
Holling (1986) concluded on the basis of extensive research that ecosystems can adapt to changing conditions through a cycle of adaptive renewal (internal dynamics). The adaptive cycle has four phases characterised by different degrees of connectedness and stored capital (Fig. 2.3):

1. ‘Exploitation’, characterised by rapid colonisation of recently disturbed areas, so that both stored capital and connectedness slowly increase
2. ‘Conservation’, during which energy and materials are accumulated and stored, so that both stored capital and connectedness further increase
3. ‘Release or creative destruction’, during which accumulated and tightly bound capital is released and connectedness declines sharply
4. ‘Reorganisation’, during which materials are rearranged to become available for exploitation.

The four phases characterise transitions from chaos to order and back. The first two phases take relatively long, the latter two phases proceed rapidly. In spatial terms, adaptive cycles at different scales are nested in each other, from individuals (e.g. the life cycle), to communities or stands (e.g. decomposition cycle) to ecosystems (e.g. cyclical vegetation – herbivore dynamics). The result is a hierarchy of adaptive cycles characterised by a certain scale and time (Holling, 1995).

These insights help us to define stability of an ecosystem as a system’s capacity to buffer internal fluctuations, i.e. to stay basically the same in terms of structure. The adaptive cycle is the self-regulatory process to remain within one stability domain. Release and destruction is part of the adaptive cycle, which enables long-term evolution and adaptation to gradual changes. Stability can be measured by the coefficient of constancy in ecosystem behaviour, e.g. productivity (Conway, 1994).

Resilience is the long-term adaptive property of the system to withstand external perturbations without changing its basic structure (based on Holling et al., 1995). Resilience refers to the size of the stability domain or the basin of attraction, around a state, which corresponds to the maximum perturbation that can be taken without causing a shift to another stability domain, or ecosystem state (Scheffer et al., 2001). Normally, during the adaptive cycle reorganisation will lead to the same or similar ecosystem structure. Loss of resilience, or reduced size of the stability domain, will lead to a flip-over to another ecosystem state following the release or destruction phase (Holling et al., 1995).

In systems with multiple stable states, gradually changing conditions may have little effect on the ecosystem state, but yet reduce the size of the stability domain (Fig. 2.2). This makes the ecosystem less resilient, i.e. more fragile, implying that it can more easily flip to another state. The flip-over of
the system with reduced resilience towards another stability domain is generally caused by both internal factors (e.g. grazing pressure) and external stochastic events (e.g. a drought period). The moment of flip-over (i.e. the prevailing conditions at that point in time) can be called the resilience threshold. To cause a flip back it is not sufficient to restore the environmental conditions before the flip-over, but conditions should be restored beyond the point of transition (Fig. 2.2).

The transitions and the threshold levels where they occur are difficult to predict, and have no ‘early warning signals’. Resilience thresholds or ‘hard’ ecological limits are difficult to predict (Ludwig et al., 1993; Gunderson et al., 1995), so that often best professional judgements are made about degradation, regeneration and pollution processes and apparent thresholds.

The new ecosystem state has another structure, which, if it has lower productivity, can be referred to as degraded. This implies that productivity (of goods with economic value) is seen as the main environmental function. However, bare and eroding hills, for instance, may deliver highly valued soil particles to downstream farmers, or may be highly valued for aesthetic and recreational uses.

The concept of resilience, i.e. the long-term capacity to stay basically the same by adapting to external change through the adaptive cycle, is critical for long-term sustainability. Ecosystems have been called ‘complex adaptive systems’ because they are self-regulating and show evolutionary change. These properties are conflicting with the human desire to control the environment and reach a high level of constancy and predictability.

2.2.2 DIVERSITY AND RESILIENCE

Biological diversity, or biodiversity, refers to the variety and variability among the world’s living organisms and ecological complexes (UNEP, 1994). Biodiversity is considered at three levels of biological organisation: genes, species and ecosystems. A distinction can be made between biodiversity in relatively natural ecosystems (wild biodiversity) and in human land-use systems (agro-biodiversity). In addition, functional biodiversity refers to the existence of a variety of regulation processes that enable the system to fix, process and recycle energy and matter and to adapt to changing circumstances. A category of ‘human cultural diversity’ is sometimes added.

Natural ecosystems can be characterised by their degree of diversity, stability and resilience. Clearly, biodiversity will usually correlate with the diversity of environmental functions. In terms of the relations between diversity, stability and resilience, it is useful to make a distinction between fragile and robust ecosystems. Fragile systems have small stability domains, show constancy and small fluctuations and occur under relatively predictable and constant conditions. But we have seen that a small stability domain corresponds to a low resilience (the system is not ‘used to great variation’). External shocks can easily cause these systems to flip-over. Examples are coral reefs, moist tropical forests, tundra’s, cold deserts. Robust systems have broad stability domains, show major fluctuations and are less predictable. They are found in areas with more variation in biophysical factors (e.g. variation in rainfall, salinity, toxicity, pests etc.). These systems can more easily withstand external shocks. Examples are wetlands, riverine, semi-arid and mountain systems.

How did biodiversity contribute to develop resilience? Biodiversity was developed through evolutionary processes and this require either long time periods with relatively favourable biophysical

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3 Examples of obvious thresholds are the minimum population size of species below which extermination occurs, or the minimum vegetation cover below which irreversible soil loss occurs (Breman and de Ridder, 1991). The sudden decline of crop yields by continuous soil depletion has been explained by a minimum level of organic matter below which water and nutrients are not anymore taken up (Cretenet, 1990).
conditions (in terms of temperature, moisture, nutrients), or a large size with variation in space and connections between sub-units. Spatial variability at different levels (e.g. landscapes, habitats, soil conditions) enhances biodiversity through niche differentiation. On the contrary, low biodiversity develops under unfavourable and highly dynamic conditions, or where spatial units are small or isolated from each other. It can be argued that where high biodiversity results from constancy in time, stability domains are small and resilience low (e.g. lowland tropical forest). Where high biodiversity results from connected sub-units, variation is high and so is resilience (e.g. many wetlands).

Spatial variability is good because it creates variation in habitats and associated biodiversity. Under resource-poor conditions (e.g. low rainfall, poor soils, too high or too low temperatures) patches with more favourable conditions occur through resource concentration. In these patches species can survive (Shmida and Burgess, 1988; Breman and Kessler, 1995). Therefore, as resource conditions are poorer ecological processes and biodiversity should be kept intact over larger areas, to allow for patchiness, diversity and thus ecosystem resilience.

The ecological regulation and processing functions are mechanisms by which self-regulation occurs (e.g. reproduction of animals, succession of plants, soil formation, decomposition, recharge of water). These functions operate through biophysical processes for which a certain diversity of species is critical (e.g. the chain of species involved in decomposition processes). To maintain this diversity, in turn, requires space for habitat with sufficient quality (buffer zones, ecological networks, protected areas). Most ecosystems can loose species but still maintain their characteristic functions and stability (Gunderson et al., 1995). However, apparently redundant species may be particularly functional for resilience, to respond to unpredictable events or gradually increasing pressures (Schultzze and Mooney, 1994; Hanna et al., 1996). It may only be a false impression that some species are redundant as long as such disturbances did not occur. In other words, many (redundant) species determining biodiversity are the ‘internal insurance’ of ecosystems to maintain their resilience.

As stated above, human management is often oriented at control and short-term constancy in time. However, too much shot-term constancy will reduce long-term resilience, because the regular occurrence of variation (a broad stability domain) and small shocks promotes or maintains diversity and regulation processes (Scheffer et al., 2001) as part the adaptive cycle of ecosystems (Fig. 2.3). On the other hand, too much variation and frequent shocks is not good for resilience, as then the phases of the adaptive cycle do not last long enough and longevity is cut short (Holling et al., 1995).

### 2.2.3 CARRYING CAPACITY

There has always been the desire to define the limits in the use of natural resources to avoid land degradation. For that purpose, the term carrying capacity is commonly applied. In the original use of this concept for rangeland management purposes (e.g. Harrington et al., 1984), carrying capacity aims to define animal numbers that can be supported, based on the equilibrium between pasture production and feed requirements. It is thus assumed that other factors (e.g. social stress or diseases) are less important than feed supply in determining the optimal animal density. Feed production, in turn, is determined by the resource of which availability is most limiting (usually water or nutrients).

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4 For instance, in semi-arid areas, locations where soil moisture and nutrients are concentrated constitute refugia that enable perennial plants and animal species to survive the dry season and drought periods (e.g. Ludwig and Tongway, 1990). Spatial variability occurs at different scales: valleys, micro-depressions, woody plants, soil between stones or rock outcrops, termite mounds, are all locations where water and/or nutrients and ecological processes are concentrated. Woody plants survive under resource-poor conditions due to the presence of various effective resource concentration and conservation mechanisms (Breman and Kessler, 1995).
Figure 2.4: The relations between stocking rate (expressed as a percentage of a theoretical maximum) and (a) animal productivity, (b) economic productivity, and (c) vegetation cover and soil protection (adapted from Harrington et al., 1984).
Figure 2.4a shows that as animal densities (stocking rates) increase, animal condition declines and productivity per head declines. In contrast, as stocking rates increase productivity per unit of area increases up to a certain maximum level. When considering economic factors, the short term profit occurs at stocking rates where the net revenues are greatest (Fig. 2.4b)\(^5\). There usually is a zone within which small changes in stocking rate do not have significant effects on net revenues (Harrington et al., 1984). Corresponding to this zone, the economic carrying capacity is defined as the number of animals per hectare that result in maximum net revenues.

All this is associated with normal years (normal rainfall), but does not take into account the internal dynamics and long-term resilience thresholds of the rangeland system. As stocking rates increase, the rangeland system is stressed (decline of stability domain) and becomes more vulnerable to external shocks, e.g. drought. Where resilience thresholds are passed the system flips to a situation of lower productivity and pasture quality (Fig. 2.4c). As a consequence, animal productivity will also drop sharply, contrary as indicated for the ‘normal’ situation. This flip-over is caused by both internal pressure (grazing pressure) reducing resilience, and is triggered by a stochastic event (drought period).

Economic carrying capacity is a function of ecosystem properties (pasture quality etc.), market prices, subsistence and cultural priorities, animal properties, etc.. For instance, pastoralists in the Sahel aim at a high milk and meat productivity per animal and good animal condition, thus animal densities tend to be low. But for agro-pastoralists the number of cattle is more important than their condition (cattle serve as cash reserve, for traction and for organic manure supply), and the economic carrying capacity is higher. The long-term carrying capacity, i.e. one which avoids change to another stability domain (lower pasture quality), is a function of ecosystem resilience and long-term changes like climatic change. A resilient rangeland management system is one that maintains a large stability domain, thus reducing the risk that a threshold is passed in case of a major perturbation. In the above example, agro-pastoralists can spoil the rangelands for pastoralists (FAO, 1996), because they have a higher economic carrying capacity, exert higher pressure on the rangelands, causing a reduced stability domain and greater risks for collapse. This picture becomes more complicated when we introduce human norms and risk perceptions and management practices to avoid loss of cattle. Pastoralists in highly dynamic ecosystems adopt opportunistic and highly dynamic management systems (see section 3.1, and also Box 2.2).

Early estimates of human carrying capacity were made for relatively simple land-use, such as shifting cultivation. These systems can be considered as relatively closed systems with a fixed level of technology. In spite of criticism on these applications (Fearnside, 1985; Moonen & Verolme, 1991), and in spite of the doubtful use of the concept for political motives (e.g. to justify transmigration programmes), estimates of human carrying capacity are still commonly made. Reference is made to some level of optimal, potential, sustainable, ecological or natural exploitation, to ‘resilience thresholds’ or ‘thresholds of irreversibility’, thresholds for land-use intensification (Burnham, 1980), or saturation thresholds in relation to population pressure (Pieri, 1989).

De Groot (1992) defined carrying capacity as: “the allowable intensity of an activity (either adding things - e.g. pollutants - or taking away things - e.g. nutrients) derived from norms in terms of human well-being and values of nature, and co-determined by human inputs and natural properties of the environment.” This definition notes the need for norms and standards of desirable qualities of human well-being and of environmental functions (e.g. desirable health standards and related norms for water

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\(^5\) Similar relations can be found for other natural resources, e.g. for fisheries. Here, the economic carrying capacity could be characterised by catch per unit effort (CPUE), which depends upon production goals, level of technology used, etc. A high CPUE will be associated with a high productivity per animal.
quality). But the concept remains difficult to operationalise. I tried to do so for integrated land-use in
the Sahel region using as a definition of carrying capacity: “the maximum level of exploitation of a
renewable resource imposing limits on a specific type of land-use that can be sustained without
cauing irreversible land degradation within a given area” (Kessler, 1994).
I defined carrying capacity at three levels:
1. At the level of environmental production functions: sustained yield levels of limiting primary
production (e.g. amount of nutrients or water) – this may be referred to as ‘providing capacity’
2. At the level of products from resource-use systems: production levels based on the above
sustained yield levels, based on various assumptions
3. At the level of human populations: population densities that can live in a certain area based on
subsistence use of these products, based on various assumptions.
However, at the second and third level of defining a carrying capacity we need to make various
assumptions related to human resource-use systems, e.g. on the level of technology, the extent in
which the resource-use system is closed (in economic terms), desirable standards of living for users.
In addition, assumptions are required on the desirable quality of the environment, e.g. habitat for
biodiversity and natural landscapes. Altogether, too many uncertainties and assumptions are involved
to work out any quantitative figure about a human carrying capacity.
Two concepts related to that of carrying capacity are those of environmental utility space (NAR,
1993) and limits of acceptable change (e.g. Stankey et al, 1999). The ecospace concept basically aims
to avoid a reduction of the available environmental services and products. To do so the quantity of
available resources should be assessed, as well as the regenerative capacities and thresholds in
ecological processes, and on the basis of that the acceptable levels of off-take or pollution. This
approach is not very different from the use of the carrying capacity concept that I proposed (see
above). But then the ecospace concept accepts that objective scientifically proven limits to resource
use are difficult to determine, and focuses at ‘safe minimum standards’ that take into consideration the
state of current (scientific) knowledge and its uncertainties, and the risks associated with the use of
certain environmental functions (for off-take or pollution). Acceptable risks or acceptable change
should take into consideration public opinion (about security, living standards, ecosystem quality,
nature areas, etc.). The final judgement is partly a political choice with an element of subjectivity.
This complex field of human perceptions of risks and security I will revisit section 2.5.3.

2.2.4 OPERATIONAL GUIDELINES FOR ENVIRONMENTAL SUSTAINABILITY

Environmental sustainability has been defined as the maintenance or improvement of ecological
processes, biological diversity and the natural resource base (e.g. Daly, 1990, Goodland, 1995, Véron,
1999). Environmental sustainability is important because human beings depend upon environmental
functions for survival, health and social well-being.
From the previous sections I conclude there are three key values that characterise the quality of
ecosystems as a life support system for human well-being (based on AIDEEnvironment, 1996):
1. Functional procurement refers to the provision of various environmental functions (in 6 categories)
that are useful for human well-being (e.g. forest products, spiritual needs, water purification)
2. Functional diversity refers to the diversity of these functions, at different levels, including
biodiversity (i.e. habitat function). This value is associated with optionality for future generations.
3. Resilience refers to the long-term capacity to withstand external shocks and stay basically the same
by adapting to external change through the adaptive cycle and evolutionary processes.
In applying the concept of environmental sustainability emphasis is often given to working out levels of ‘sustained yield’ or ‘allowable emission’, i.e. the balance between demand and supply for environmental products with (high) economic value. This refers to the economic carrying capacity as worked out in the previous section. The importance of environmental products and services with indirect economic values is also being increasingly accepted. However, I have emphasised the importance of resilience for environmental sustainability, referring to long-term adaptive capacities, and not only short-term (buffering, stabilising, regenerative) properties.

Working out resilience in operational terms is not easy. Resilience should be further defined in terms of its spatial context (resilience at what scale?) and time horizon (resilience within which time perspective?). These aspects are ecosystem dependent. For instance, robust ecosystems show more ‘natural variation’ than fragile ones, and often have lower ‘natural’ biodiversity; striving for maximum stability and diversity in every ecosystem is not useful. In ecosystems under resource-poor conditions the ecological processes and biodiversity operate at larger scales than under resource-rich conditions. The appropriate scale level and time horizon for resilience seems to be associated to the adaptive cycle: does the area represent different phases, and does the time horizon allow for renewal? This requires insight in ecosystem functioning. But it also requires insight in the norms of human society, to determine the level of acceptable ecosystem change.

These considerations lead to the following principles for environmental sustainability (Figure 2.5).

1. For maintaining functional procurement and diversity as considered desirable by human society at level X within a time period Y, the critical production processes and associated biodiversity should remain intact at level X. This refers to security of the provision of desirable environmental functions within a certain time period Y.

2. For long-term resilience of functional procurement and diversity at level X, one should look at functional diversity at level X+1 (the context), and consider a time horizon of Y+1. Within these dimensions, the emphasis is at environmental regulation and processing functions and biodiversity, because these determine long-term resilience at level X.

3. In view of the partly unpredictable needs and demands of future generations, the potential to provide the full diversity of products and services should remain intact. This also refers to maintenance of functional diversity at level X+1 over time periods Y+1, to maintain the potential for optimal functional procurement and diversity (optionality).

4. Resilience of functional procurement and diversity at level X+1 in turn depends upon functional diversity at level X+2, and a time horizon of Y+2, etc.

5. At each of these scale levels, human interventions and influences should ensure that the adaptive cycle remains operational, i.e. keep intact the capacity of ecosystems to adapt to changing conditions through processes of release and renewal. This implies that certain short-term changes should be accepted (large stability domain) for the benefit of long-term resilience.
These guidelines can be made operational as follows:

6. Starting point should be knowledge about ecosystems and interactions with human exploitation (Figure 2.1), including critical ecological processes, biodiversity values, degradation thresholds, economic carrying capacity, levels of acceptable change, ecological processes of release and renewal, etc. To maintain resilience, it is important to look at these aspects at scale and time limits that are beyond our direct interest. This requires insight in historical processes, going back in time and assessing environmental changes, and looking at ecological processes at greater spatial scales.

7. In most cases various uncertainties remain, for which the precautionary principle should be applied to avoid undesirable transitions of resilience thresholds. The following measures are always useful:

- Reduce human pressures, particularly non-natural human interference, where degradation signs occur (e.g. through reduced off-take, rehabilitation, greater resource-use efficiency);
- Maintain and create buffers and reserves, and accept short-term changes and adaptation through release and renewal, to maintain a large stability domain and keep resilience intact;
- Maintain functional diversity, at species level (also of apparently redundant species which might be critical for long-term resilience), and at habitat and landscape levels (by diversity of resource-use systems, ecological networks and intact ecological processes);
- Avoid rapid changes by external factors (in terms of pressures), as these may surpass the capacity of the adaptive cycle to adapt to change;
- Install environmental monitoring and early warning systems, with adequate linkages to management systems.

Box 2.1 gives an illustration of applying these principles.
Box 2.1: Environmental sustainability principles applied to cotton growing in savanna areas

The example is a semi-arid savanna area where the main human interest is to grow cotton (as the main cash crop at level X). Cotton growing is part of an integrated agro-sylvo-pastoral system at community level (level X+1). Here, environmental sustainability would imply the following.

- The primary interest is to keep intact the environmental production functions required to grow cotton. For short-term stability, this implies adequate supply of water and nutrients, avoiding erosion (contour bunds, no cropping on strong slopes), crop rotation, no cropping on shallow soils. These issues are generally well-known.

- For long-term resilience at field level (level X) soil organic matter and the diversity of soil fauna for decomposition processes should be maintained, as these are critical ecological regulation and processing functions for cropping systems in semi-arid areas (to avoid soil loss, assure water holding capacity against drought, supply nutrients). This requires sufficient return of organic materials (crop residues, litter), no excessive disturbance of soil fauna, no deep ploughing.

- To maintain resilience at field level, functional diversity should be kept intact at level X+1, i.e. community level. This refers to representative forest areas, grazing reserves, wetlands, tree species. This also meets the need to maintain current integrated land-use and maintain optionality for future generations (e.g. if urban people want nature areas for recreation purposes). The aim is to assure the future potential to provide all available environmental functions at level X+1.

- At level X+2, i.e. the regional ecosystem / landscape level, sufficiently large areas with the original plant and animal diversity should be maintained, e.g. in the form of an ecological network, to allow for adaptive change processes, e.g. as a response to climate change. Isolated patches of woodland do not suffice, nor forest plantations with low biodiversity. At level X+2, functional diversity for resilience purposes includes the maintenance of the regional water balance (e.g. to buffer drought periods). This critical function should also determine the area and location of dense vegetation in an ecological network.

- Also at level X+2, there should be at least one area with natural habitat, large enough for natural herbivores to reproduce and have different populations to ensure genetic diversity and long-term evolutionary adaptation. Large herbivores play critical roles in ecological regulation processes and resilience of savanna ecosystems, e.g. after drought or fire.

- The use of chemical inputs (fertilisers, pesticides) should not only be based on levels of sustained yield and allowable pollution at level X, but also be evaluated for the impacts on functional diversity at level X+1 and over longer periods (e.g. effects on populations of birds, insects and soil micro-fauna), and at level X+2 (e.g. effects on downstream wetlands, effects on the food-chain and on migratory birds).

- If long-term effects are uncertain, the precautionary principle should be applied. Keeping indigenous trees on or around cotton fields contributes to long-term resilience. To reduce pressures, options for more sustainable use of savanna areas should be considered, i.e. income opportunities from intact forests, like hunting, urban recreation, tourism, carbon trading.

- Ecological processes of release and renewal must be kept intact: at level X the incidence of termites in processes of nutrient and soil organic matter build-up and break-down; at level X+1 soil restoration processes (fallowing) and regeneration of pastures (rest periods); at level X+2 vegetation renewal through forest fires and the incidence of drought on the vegetation.


2.3 SUSTAINABLE DEVELOPMENT

Here I will look at how environmental sustainability interacts with socio-economic development, in two ways: realising environmental opportunities for socio-economic development, and avoiding unacceptable environmental change. Striking this balance is the core of sustainable development.

2.3.1 MAIN CHARACTERISTICS

Sustainable development can be viewed as a response to problems provoked by global development, of which problems of affluence, transition and poverty are key dimensions (Roome, 2001). Sustainable development was defined by the World Commission on Environment and Development in 1987 as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” (WCED, 1987).

Sustainable development aims at maintaining and improving per capita well-being over time. Most importantly, human well-being includes equity aspects: well-being of future generations (intergenerational equity) and well-being of the poorest in society (intragenerational equity). Others emphasise environmental protection, social security aspects or economic growth. Considering these different points of attention, sustainable development involves at least three dimensions: social, economic and environmental.

Secondly, sustainable development is about managing and improving the asset base available to present and future generations. This asset base can be defined as stocks of capital. Capital is defined as an input to the production of well-being which yields a flow of services over time. Environmental economics literature has tended to classify the forms of capital as follows (World Bank, 1997):

- Physical or human-made (or reproducible) capital (roads, factories, machines etc)
- Natural capital (soil, water, biodiversity, scenery and other environmental functions
- Human capital (the stock of knowledge and skills)
- Social capital (the norms, networks and trust between people and between organisations).

Thirdly, sustainable development is a continuous process of change, not the definition of a final situation. In spite of the human desire for constancy and security, to sustain a developed situation would be a paradox. In the first place, this is because ecosystems are complex systems showing adaptive change. Secondly, global systems are becoming increasingly connected (in terms of economics, institutions and information flows), with uniformity in terms of economic systems, which reduces resilience at every level. Thirdly, the current rates of change appear to often outstrip the capacity of ecosystems, livelihood systems and institutions to adapt and respond. In other words, sustainable development as a process should ensure that resilience to external stresses and shocks is maintained, within ecosystems, livelihood systems and institutions.

Pearce et al. (1989), based on concepts of agro-ecosystems research were the first to discuss ‘sustainability as resilience’, or the capacity of systems to respond to external disturbance as ‘a feature often lacking in human-made capital’. This underlines the importance of sustainable development as a process of adaptation, innovation and learning, and resilience as a key attribute of human institutions.

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6 Environmental assets are generally incorrectly referred to as ‘natural resources’, as explained in section 2.2.
2.3.2 FINAL VALUES FOR SUSTAINABLE DEVELOPMENT DIMENSIONS

For the three dimensions of sustainable development criteria should be defined to assess the level of sustainability. This relates to the idea of ‘final values’, defined as values for human well-being that usually do not require further normative justification (based on De Groot, 1992). The following final values can be proposed (Kessler, 1999; Kessler et al., 2000), see Figure 2.6, with the area of overlap between the three dimensions as an ideal situation:

1. For social and cultural sustainability: health (physical and mental), security and autonomy or ownership
2. For economic sustainability: production (quantity and quality of material and non-material goods and services), efficiency (of production systems), equity and optionality (for future generations)
3. For environmental sustainability: functional procurement, functional diversity (at species, habitat and landscape level) and resilience.

Human institutions can be considered as the major supportive component to meet final values, the performance of which can be characterised by five key values (see Figure 2.6): transparency, accountability, integration, participation, responsiveness and resilience.

To further operationalise these concepts, for each of these values specific criteria, indicators and norms should be defined for a particular situation and context. In chapter 4 I will elaborate on the institutional component, and show how resilience as a key characteristic can be made operational.
Looking at the relations between the environment and socio-economic well-being (Fig. 2.7), functional procurement (the provision of goods and services) strongly contributes to economic key values. Functional diversity is particularly important for equity, to meet variable needs of social groups. It also increases the quality and diversity of livelihood systems, reducing vulnerability and making them more sustainable over time because diversity allows for positive adaptation to changing circumstances (Ellis, 1999). For instance, the diversity of cropping systems (with different crops spread over a range of soil types with different water regimes), or the mobility of pastoralist systems in a diverse pastoral setting, are practices in semi-arid areas to survive drought periods. Diversity also provides options to address unexpected problems (e.g. plant diseases, climate change). Environmental diversity stimulates cultural diversity, such as languages, arts and rituals. Health benefits from environmental values directly (e.g. medicinal products) or indirectly (e.g. resilience).

2.3.3 VALUES AND NORMS FOR STRONG SUSTAINABILITY

If sustainable development involves maintaining (or increasing) per capita assets over time, the issue arises as to whether each of the forms of capital is to be maintained over time or whether it is sufficient to keep constant the aggregate stock. The approach that stresses the importance of each separate form of capital is known as strong sustainability (SS). SS approaches tend to focus at one form of capital, e.g. environmental capital. The approach that looks at aggregate stocks is known as weak sustainability (WS). In the WS approach loss of certain capital, e.g. environmental assets, is accepted relatively easy, provided that this loss is compensated for by an increase of other, e.g. economic, assets. This refers to the possibility of substitution between different forms of capital.

According to the SS approach, and in line with my interpretation of environmental sustainability, many parts of natural capital cannot be substituted. One should respect resilience thresholds, e.g. for species survival or equality of ecological processes, and maintain optionality on natural capital, e.g. unknown medicinal properties of biodiversity. From an economic point of view it would be important to quantify resilience thresholds. The fact that this is often difficult is frustrating for economists who then claim that the SS approach cannot be made operational. Where resilience thresholds are

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7 Conway (1994) defines as qualities of rural livelihood systems: productivity, stability, autonomy and sustainability.
8 There is a rough correlation between the diversity of native languages and biodiversity, both of which are now disappearing at a high rate (Sampat, 2001).
9 Goodland (1995) distinguishes a third approach, that of absurdly or super-strong environmental sustainability which claims that even non-renewable resources must not be exploited.
unknown, as is often the case, the SS approach implies application of the precautionary principle. The apparent problem of different approaches and substitutability could be conceptually solved by defining two different categories (tiers) of values and principles: first tier values that cannot be substituted, second tier values that can be substituted (De Groot, 1992). What is substitutable and what is not is a practical matter:

- Can we substitute the protective properties of a dune? Yes, we can by building a dike
- Can we substitute natural nutrient supply? Yes, we can by chemical fertilisers
- Can we substitute a tiger? No, we cannot
- Can we substitute the ozone layer? No, we cannot.

There are also less obvious issues, such as:

- Can we substitute a dune landscape? Yes, for purposes of sea protection we can build dikes, but substituting all dune landscapes by dikes will threaten resilience, e.g. if sea level rises maintaining ever higher dikes becomes too costly. But for landscape scenery, water buffering capacities, habitat for biodiversity etc. a dune landscape is difficult to substitute.

This would bring us to a two-tiered approach of decision-making with respect to natural capital:
1. The first tier: not substitutable, or most likely not substitutable, environmental functions
2. The second tier: substitutable, but then requiring major human management inputs.

I conclude that the SS approach is applicable to first-tier values, while a WS approach is applicable to second-tier values. In other words, a cost-benefit analysis and other economic measures can only be applied to second tier values. It is proposed to define for every situation first-tie values, based on the operational principles for environmental sustainability. For these values we also need bottom-line standards (quality standards of the values).

Similar to natural capital, there are basic values associated with the social and economic dimension of sustainable development. Examples are indigenous cultures or native languages, the right of minimum incomes and social services to allow a minimum level of well-being, access to safe water, equity in terms of wealth distribution, etc. So for every sustainable development dimension, there are first-tier values which cannot be negotiated. Sustainable development processes are about stakeholders defining these values and associated bottom-line standards and negotiating the trade-off of present choices for the future (temporal trade-offs) and for other localities (spatial trade-offs).

The scale of spatial trade-off processes may vary: e.g. croplands versus sylvopastoral areas at village scale, urban areas versus rural areas at a local scale, economic centres versus hinterlands at a national scale, industrialised countries versus developing countries at an international scale. At a global scale, for instance, the Netherlands uses an area in the world equal to about seven times its land surface to sustain its economic growth and maintain its human well being (IUCN, 1994). This has potential environmental impacts, but also provides an opportunity for economic development elsewhere through trade and foreign currency. The critical questions to be posed are:

- Have first-tier environmental values been defined for the localities where exploitation or pollution occurs (e.g. formalised as environmental standards)? If yes, are these first-tier values respected; if not is the precautionary principle applied (according to the SS approach)?
- Is the loss of second-tier environmental values effectively used for by building up other forms of capital, so that aggregate capital (e.g. for poverty alleviation) is increased (the WS approach)?

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10 For instance, it was not known until the 1980’s that carbon dioxide emissions affects the atmosphere and climate – a part of natural capital.
2.3.4 A MODEL ON ENVIRONMENTAL RESILIENCE AND ECONOMIC DEVELOPMENT

To better understand why long-term environmental resilience is commonly neglected in the light of economic, let us look at a model developed by Aidenvironment (1996) on the interrelations between economic development and the environment. Using the three environmental values (functional procurement, functional diversity and resilience) the model describes in a historical perspective how ecosystems were manipulated to provide a high yield of one or a few desirable products, particularly export products (increase of functional procurement). The progression from low to high economic living standards typically involves a transition from diversity to specialisation and intensification of land-use for a few products. Human interventions to achieve this change generally reduces functional diversity (including biodiversity and certain ecological processes), as a result of specialisation. This will affect resilience of the system and thus reduce security of livelihood systems (section 2.2.3). These undesirable effects are generally compensated for by artificial means using capital and human resources, to assure a desirable level of security. For instance, where vegetation cover is being stripped away to maximise the productivity of a cash crop, mechanical barriers or contour bunds are established to reduce the incidence of erosion or landslides. Where coastal lagoons that provide protection of coastal soils to sea waves are developed for tourist infrastructure, mechanical barriers are placed to protect the land. In brief, security is now being provided by human management inputs instead of by natural (free of charge) ecological processes and related biodiversity (Fig. 2.8).

The desirable stability and security through human management inputs generally deals with relatively small and predictable (‘normal’) environmental forces (e.g. a drought period, a storm). However, the question is to what extent these human measures can provide long-term resilience to gradual changes (e.g. climate change, pest resistance, soil erosion). The fragility of monopoly markets when faced with unexpected price fluctuations mirrors the fragility of mono-cultures and ecosystems when faced with natural catastrophes or social upheavals. Once the system collapses, large investments are required to rebuild the human management system or to restore ecological processes (e.g. in the case of major floods, one might rebuild higher dykes, or restore the natural wetland system to protect the land). Biodiversity loss is also associated with the reduction of an ecosystem’s future economic development options (Ehrlich, 1988).

One example showing these relations is a study from the Solomon Islands (Carothers, 1999). Here industrial development focuses at clearing the forest and producing one product (palm oil), for which current market prices are good. This option eliminates other land-use options and reduces potentials for fisheries through pollution and sedimentation. The original production system has a range of small-scale options and products that can be marketed, with benefits for different stakeholders, and with a higher total biomass. The original system is more diverse, shows more resilience to environmental and economic stress (e.g. hurricanes or declining market prices of palm oil), and maintains optionality of goods and services for future generations. The high market price for palm oil is the main reason why the less sustainable option is chosen, even when it was demonstrated that the range of products from the small-scale option has a potentially three times higher value. Figure 2.9 gives an example for tropical forests, where transition phases and development options are classified with respect to their level of biodiversity and management inputs. Many more examples could be given.
The relationship observed between environmental quality and economic development is often seen as an environmental Kuznets curve (EKC), after Kuznet's observation on how income distribution often initially worsens with economic growth but improves as growth continues. The EKC portrays a relationship where economic growth is initially linked to a decline of environmental quality, but at a later stage is followed by a period of 'de-linking', i.e. a delinking between economic growth and environmental degradation (Figure 2.10). EKC has been validated for aspects of air pollution and water quality. The concept is relevant for the WS approach, whereby a substitution of natural capital might be corrected at a later stage, implying that countries grow out of their environmental problems.
There are two explanations for the existence of the EKC. Firstly, as incomes grow households are increasingly capable and willing to pay for environmental improvements, and these preferences are reflected in, for example, more stringent environmental policy. Secondly, structural change within economies concurs with technology development that allows improved resource efficiency and less resource use, as evidenced by the increasing importance of the service sector in the developed world.

There are various types of criticism on the EKC. First of all, there is evidence that the ‘de-linking’ observed in developed countries (as a result of improved technology mainly), has been superseded by ‘re-linking’ due to a continuous increase in consumption, e.g. of energy (Bruyn et al., 1995). Thus, there is a fundamental problem that issues like energy use and climate change do not fit in the EKC model. These problems do not have technical end-of-pipe solutions. Secondly, many developing countries do not show substantial economic growth, and are still far from income levels at which in developed countries de-linking has occurred. Thirdly, the level of social services and governance is different from that of many developed countries, while these greatly influence the potential for environmental improvements.

Lastly, and most importantly, the EKC has been validated for environmental problems of pollution, but many environmental problems in developing countries (e.g. deforestation, soil erosion) follow different dynamics. For instance, I showed in Annex 1.3.3 how opening up of tropical forests for timber exploitation is part of a process which, influenced by both local and supra-local factors, continues until all forest has been converted to agricultural land (see also Rudel and Roper, 1997). At this stage the tropical forest cannot be restored, change is irreversible, resilience has been exceeded.

As I showed in the previous section, the predominant type of economic development leads to an increase of functional procurement for a few selected products or services, a decline of diversity, and as a result a decline of the capacities of the environment to provide natural resilience (Kessler and Van Dorp, 1997). Resilience is critical for long-term security; it refers to the capacity of livelihood systems to adapt to changing conditions, without sudden changes (passing of thresholds). In developing countries many livelihood systems cannot afford high management inputs, and therefore continue to rely upon natural resilience (in principle free of charge) for long-term security. As a result of global environmental problems and loss of resilience, many households will perceive a decline of security without having the means to compensate this.
2.4 THE PROBLEM-IN-CONTEXT MODEL

Environmental problems are defined as acts of reflection, hence are perceived by people; in this sense nature has no problems. To solve environmental problems, we need to understand people, their social arrangements and institutions, but also values and perceptions with respect to the quality of environmental functions. Actor-oriented approaches were developed within rural development sociology (Long, 1989)\textsuperscript{11}, based on the assumption of social actors who are intentional, construct their realities, and can exert ‘agency’, i.e. make a difference in the world. By emphasising intentionality, instead of assuming set objectives (e.g. maximised utility for economic purposes), the actor perspective pays attention to the diversity of conflicting goals, attitudes, values, aspirations and norms. Actor-oriented approaches then focus at the arenas in which actors struggle, negotiate, accommodate and sometimes agree to undertake action. The actor perspective also studies how different and multiple realities are created, maintained or adapted in social interaction (Röling, 1994).

While everyone will agree on the existence of thresholds and boundaries in ecosystems and in economics (‘hard systems’), actor-oriented approaches emphasise the ‘soft system’ perspective. Soft systems are social constructs, they exist only to the extent that actors agree on their goals, boundaries, membership and usefulness. Merging insights and perspectives from both hard system and the soft systems approaches in concrete planning or decision-making (e.g. for environmental management) will be further explored in Chapters 5 and 6. I will now focus at use of the problem-in-context model as part of a pragmatic and action-oriented approach of progressive contextualisation to explain environmental problems by identifying human contextual factors and the concrete actors involved.

2.4.1 THE PROBLEM-IN-CONTEXT MODEL SUMMARISED

The problem-in-context (PiC) model aims to establish a linkage between the social and biophysical reality of environmental problems (De Groot, 1992, de Groot, 1998). Central to this conceptual model is the recognition of an environmental problem, which is defined as a negative discrepancy between the norms or standards of desirable qualities on the one hand, and the reality and actual qualities of the environment on the other hand. Norms vary between different actors and in time. Therefore, a certain situation can be perceived as a problem by one actor, but not so by another. For instance, a situation can be perceived as degraded by one actor (e.g. a farmer with sand-blown croplands, or a heavily degraded landscape) while another considers it as desirable and attractive (e.g. a tourist enjoying these sand dunes or an eroded landscape). Also, we could foresee future problems if the direction of observed changes reaches certain thresholds of acceptable change. Fig. 2.11 shows how this negative discrepancy can present itself at four different levels:

1. Do human activities affect environmental capacities? E.g. forest clearing causing unacceptable loss of biodiversity
2. Are environmental effects acceptable? E.g. agriculture on cleared forestland leading to erosion
3. Are the impacts on environmental functions within acceptable limits? E.g. topsoil loss makes the land unsuitable for agricultural production in the area
4. Are the impacts on final values acceptable? E.g. poverty and loss of income due to land becoming unsuitable for agriculture.

\textsuperscript{11} Actors can be defined as social entities (individuals or institutions) that play a role (e.g. causing or solving problems) in relation to environmental management. Stakeholders are a category of actors with a direct dependency on environmental functions. Apart from stakeholders there are actors with an indirect dependency on environmental functions.
The PiC model should be regarded as a conceptual framework to guide a process of defining and explaining environmental problems, in order to identify appropriate solutions. During this analytical process the ‘environmental problem in its context’ is constructed from causal chains. This process can start out from any point in the chain (or any event that seems important and attracts attention). While systems have boundaries and the aim is to understand and quantify its elements and relations, causal chains are like stories (De Groot, 1998). Studying these causal chains can be done through ‘progressive contextualisation’ (Vayda, 1983). Progressive contextualisation of an environmental problem deals with causal chains in three ways:

1. The biophysical chain: cause-effect chains between different elements within the ecosystem
2. The social chain: understanding the actors to gradually build-up an actor’s field which shows the interactions between actors at different levels in causing the problem
3. The normative aspects: determining actor’s norms and how the normative observer may justify his final values and norms.

Once an environmental problem has been defined (usually at level 2 or 3 indicated in Figure 2.11), building an actors field through progressive contextualisation helps to identify the factors and associated actors that lead to the problem. A practical application of the PiC model is demonstrated in Figure 2.12, which looks into the actors field for the problem of declining soil fertility as a result of continuous cropping in the Sahel region. Note that this is only part of the actors field for this problem.

Figure 2.11 Basic framework of the problem-oriented approach, with possible problems defined at four levels (adapted from de Groot, 1992)
Figure 2.12: Example of part of an actors’ field for the environmental problem of declining soil fertility due to continuous cropping. Arrows indicate the causal chain of explaining the problem.
For building up an actors field there is no need to unravel whole systems with their elements, but a systems approach can be useful to better understand key elements of the biophysical chain (e.g. environmental functions, trends, resilience thresholds) and the social chain (e.g. the institutional setting, social arrangements, dependencies). This analytical approach emphasises the social relations within which different categories of resource users are embedded and its effect on their concrete actions. It is a political ecology approach which assumes that root causes of environmental problems are situated in power relations that are governed by economic and political forces mainly (Blaikie and Brookfield, 1987). Insight is created in the options and motivations of actors, how these are influenced by contextual factors and other actors (often at higher levels), and ultimately a picture emerges of the key actors and factors directly and indirectly causing the environmental problem (from primary actors at local level to secondary and other actors at higher levels). For each actor insight is generated in the current and alternative options and motivations for certain behaviour. This approach, if properly executed, will also require insight in the psychology of human nature, as only then one can fully understand why someone acts as he/she does.

2.4.2 THE PROCESS OF APPLYING THE PIC MODEL

When using an approach of ‘progressive contextualisation’ the validity of the outcomes and its relevance for concrete decision-making depend upon the quality of participation during the process. From a social perspective the analytical process is one of social construction, whereby a diversity of actors with different views and perspectives, reflect, negotiate and agree upon joint action to improve a given situation. This requires insight in the multiple perspectives of the actors involved. It can be achieved by ensuring active participation of relevant actors, as part of a ‘process approach’ whereby people are considered as participants or partners rather than subjects or beneficiaries (De Groot, 1992). Ideally it is part of a continuous process of learning, building new organisational arrangements and institutions to facilitate change. For development processes to be sustainable, the relevant actors should participate (Pimbert and Pretty, 1997). Interactive policy development which involves stakeholders in area-based planning is now being commonly advocated (Röling, 1997). In Chapter 5 I will discuss more in-depth practical methods of participatory and interactive design processes.

The PiC model emphasises participation by three categories of actors:
1. Actors who are part of the social causal chain (from primary to secondary etc. levels)
2. Victims of the environmental problem

The first two categories can be considered as insiders, with more or less direct relations and dependencies to the problem. The relation between actors and victims can vary, but is important to understand in order to be able to identify solutions, for instance:

- Primary actors are victims (of their own actions); they may be fully responsible for their actions (so are fully accountable) or may be strongly influenced by other actors (e.g. local leaders) who in most cases are beneficiaries (so these are accountable)
- Primary actors and victims are different; for instance men and women, rich and poor, land owners and land-less at one locality. There can also be a trade-off of environmental impacts in time (future generations) or in space (other locations, e.g. downstream areas).

If primary actors are both victims and responsible the problem is relatively easy to solve (this situation is rare because primary actors will generally change their habits before a problem becomes urgent). In all other cases solving the problem will require negotiation by victims, actors and the normative
observers. A normative observer is often an outsider who aims to take an independent position and represent more or less universal values and norms. It refers to the critical role of an external agency in participatory processes, to support and empower people as actors to make their own decisions, rather than seeing them as beneficiaries that need to be controlled and motivated (Pimbert and Pretty, 1997). The normative observer should also ensure representation of actors who cannot actively participate (Kessler et al., 1999). These so-called ‘absent stakeholders’ should include:

- Future generations
- Actors affected at a large distance (e.g. island communities affected by climate change)
- Minority, poor or marginalised actors (who cannot actively participate or present their views)
- The intrinsic values of nature and biodiversity.

2.4.3 ON VALUES, NORMS AND STANDARDS

Applying the PiC model to define and explain environmental problems, and come to relevant actions, is basically about defining values and norms for environmental functions (goods and services). Unfortunately, there is a range of related terms that are often used without proper definitions: values, norms, standards, attitudes, views, visions, beliefs, knowledge systems. All of these terms may relate to the way people value environmental sustainability and human development.

I will try to make a useful classification of how these terms are related. There is a hierarchy from more fundamental cognitive ‘frames’ and value systems towards resulting norms, perceptions and attitudes (time- and issue-bound). Sabatier (1993) states that value systems or belief systems are a set of basic values, causal assumptions and problem perceptions. One could also speak of a paradigm. A paradigm consists of three layers (adapted from Sabatier, 1993).

1. A core layer of values, assumptions, visions and beliefs.
2. A second and third layer of social and policy norms and standards, e.g. as regards communication, participation, open markets, law enforcement, etc..

Value or belief systems are fundamental to how people perceive environmental problems and what solutions can be developed. McNeely et al. (1995) distinguish five different belief systems:

1. Deep ecology, giving priority to biodiversity, man not interfering with nature
2. The ecological approach, with environmental impacts accepted if required for human survival
3. Stewardship, whereby manipulation is accepted but a strong sense of responsibility is there
4. Multifunctional use, focusing on the combination of economic use and environmental management
5. The techno-economic attitude, with much confidence in technical solutions and environmental resilience.

Here is some more clarification about values and norms, partly based on Cornelis (1988). Values are largely emotional or ‘natural’ principles or truths; there would be no discussion about it. There are more or less universally accepted values, like ‘the right to live’ and ‘equity, or more specific values

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12 Examples of cognitive views are: the Dutch view of the sea as a major threat that should be controlled at each price (De Groot, 1987), the view in many semi-arid countries that water supply should be secured at each price to avoid drought effects (reason why dams are built even if this conflicts with economic rationale), the view that forests should be cleared to reduce the threat by wild animals and pests, the view of pastoralists in drylands that water should be accessible to everyone and its use cannot be controlled.
with a validity for a certain locality and actor. Unfortunately, many values only become apparent in
the face of their opposite un-values: values are associated with un-values. These values have lead to
social norms, standards and rules for desirable qualities (e.g. the level of equity). Norms are meant to
better manage and organise society. Like values, norms may vary between localities and actors. In the
face of change (e.g. population pressure, climate change, globalisation) there is need to adapt norms
and standards. This is a process of interaction and communication that takes into account social
systems and human desires.

Environmental values also vary by locality and actor. While for one soil protection by vegetation
against erosion is a key environmental value, for the other clean air is a major value, or the presence
of primary forest. Norms should be determined as part of applying the PiC model. For instance,
concerning a forest, a farmer may have the norm to reduce forest cover to such an extent that
sufficient crops for food security can be grown (subsistence food security is the primary norm, from
which a norm for forest cover is derived). The forest agent has the norm to maintain forest timber
production and will exploit it according to levels of annual allowable cut. The ecologist has the norm
to maintain cover of primary forest in the region at 60%, without any exploitation, because this is a
minimal requirement to maintain biodiversity and ensure long-term resilience. Thus, norms vary
between different actors in one area. Norms may also vary in time, e.g. for the local farmer as a
response to food security crisis, the forest agent as a response to the collapse of timber prices, the
ecologist as a response to new ecological insights. Since norms can vary, it is useful to gain more
insight in the underlying perceptions and value systems. This would allow one to draw more firm
conclusions as regards the human context of a certain situation. This type of investigation in fact
involves a type of (applied) ethics research (De Groot, 1998).

There is need to gain insight in value systems and associated norms for different localities and
actors, as part of applying the PiC model, and understand how these relate to a certain environmental
and development context. Analysis of concrete events and behaviour can help gain such insights.
Insight in value systems is helpful to understand and construct reality from the perspectives of
different actors.

It is important to realise that where (environmental) problems cannot be solved within the context
of a certain paradigm (set of values, norms and standards), there may be need for a paradigm shift.
Double-loop learning can be a mechanism to achieve such a change (see section 2.5).

2.4.4 CONCLUSIONS ON USING THE PIC MODEL

The process of using the PiC model (see Chapter 6) has been mainly qualitative, to build up insight in
the interrelations between the biophysical and social reality by exploring (through progressive
contextualisation) the network of underlying contextual factors and associated actors, in relation to an
environmental problem (Figure 2.12). In stead of analysing biophysical systems (as ecologists like to
do) or political-economic systems (as sociologists like to do), the process is one of gradually building
up insight on interconnections, largely through a causal chain approach that has a broader application
than a systems approach. This is an inter-disciplinary undertaking. If properly done one will encounter
political, economic, historical events and factors that determine the motivations of actors. The
process can clarify conceptual confusion, which often is at the basis of conflicts: which are empirical

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13 This does not mean that systems studies are not useful. On the contrary, in developing a causal chain, use is made of
existing knowledge and information on the functioning of (sub-) systems, and more quantitative system analyses are
required on critical contextual factors or actors (as part of the biophysical or social chain).
facts, subjective assumptions, views or normative perceptions? As such, this approach is more comprehensive than the commonly-applied ‘problem tree’.

I found it particularly useful to identify during the process of progressive contextualisation, the knots and levers in the causal chains, and related to that solutions and promising actions (new initiatives, break-through issues). Thus, the PiC model is used to explain environmental problem and identify promising actions. One can also start out from an event, current change or proposed intervention, in stead of starting out from an environmental problem, and from there on construct the biophysical and social chains of causes and effects leading to these events or changes (Vayda and Walters, 1999). A more pro-active approach and focus at opportunities is attractive, and here private sector innovators are useful participants.

An important question is that of ‘when does the cause-effect story end’? In view of its pragmatic and action-oriented character, the process could stop when causes or solutions have been identified that are realistic. However, it is important that in every situation insights are also obtained on root causes, relevant social structures and political-economic processes at (inter) national levels, before concrete actions are undertaken. This implies that one should aim for analysis of causal chains one level beyond the direct interest of the actors involved. This meets insights derived in section 2.2, where it was found that environmental resilience is mainly determined by issues found at one scale level higher (level X+1) and one time horizon further (time horizon Y+1) than the direct interests. This difference could be referred to as the ‘sustainability relevance’ as compared to the ‘solution relevance’.
2.5 ADAPTIVE MANAGEMENT OF COMPLEX SYSTEMS

Adaptive management is an approach to deal with complex systems, including many ecosystems and their interactions with human society. I will introduce the concept of ‘guided adaptive management’ as an approach to manage complex systems with a clear direction and within certain (social and environmental) sustainability limits.

2.5.1 CHARACTERISTICS OF COMPLEX ADAPTIVE SYSTEMS

Systems that are characterised by non-linear dynamics are defined as ‘complex systems’ (Waldrop, 1993, Gell-Mann, 1994). Complex systems show a certain level of unpredictability in their responses to external pressures and shocks. They have a relatively high degree of structural diversity and are self-regulating and resilient through the adaptive cycle (section 2.2.1, Figure 2.3). As the phases of exploitation and conservation usually take longer, the overall impression may be that of order, but during the short phases of release and reorganisation there is apparent chaos. Complex adaptive systems can adjust by changing structure from within but may also suddenly flip to another structure (state). This can be called self-organisation or restructuring. A complex adaptive system is most resilient within certain bounds of chaos (external disturbance and internal change).

Detailed studies of complex systems do not facilitate precise predictions, because slight alterations in determining factors can have major implications. For instance, detailed studies of agro-ecosystems often do not lead to reliable predictions when and where irreversible land degradation will occur. Geldof (2001) states that instead one can discern certain patterns in complex systems, such as spatial patterns, patterns in response to catastrophes, patterns of interactions between organisms, etc. These patterns are governed by simple processes and principles.

Box 2.2 gives an example of complex systems dynamics for human agro-ecosystems, with apparently non-rational risk perceptions and human behaviour in the Sahel region.

2.5.2 PRINCIPLES OF ADAPTIVE MANAGEMENT

Complex adaptive systems are found everywhere: brains, immune systems, ecosystems, cells, developing embryos and ant colonies (Waldrup, 1993). Many social systems (behaviour, stimuli response, interrelations) also show characteristics of complex systems. These systems are difficult to describe. On the contrary, systems showing linear and predictable dynamics are ‘simple’ and easy to describe. Likewise systems without any order are easy to describe (‘chaos’ or ‘random’ systems). Complex systems are in between these two extremes. The critical characteristic is that they are self-regulatory and resilient from within, and to be so do not require any external steering (Geldof, 2001). For social systems this is closely related to the concept of learning organisations, whereby resilience largely depends upon capabilities of learning, adapting and changing from within to a changing external context.

Adaptive management has been defined by Holling (1995) as “the release of human opportunities that require flexible, diverse and redundant regulation, monitoring that leads to corrective action and experimental probing of the continually changing reality of the external world”. It is a management approach suitable to deal with complex systems at any scale level. Adaptive management allows and stimulates self-regulation to reach defined management goals, and does so through careful and limited steering, not through controlling. Adaptive management makes use of the existing diversity and complexity to adapt and be resilient, in stead of reducing and controlling diversity and complexity.
Box 2.2: Risks and safety standards in the Sahel region

Complex adaptive system dynamics may help to understand risks and apparently irrational safety standards by different actors in a changing context. When confronted with natural fluctuations and unpredictability in terms of the supply of natural resources, resource users will take measures and precautions to increase safety and reduce vulnerability (risks), i.e. to cope with natural variability. Their coping (adaptive) strategies could be considered as a human corollary to ecosystem resilience.

In the northern Sahel region droughts are a common phenomenon, and people developed livelihood systems to cope with recurrent droughts. These systems were opportunistic in nature, characterised by high mobility of livestock movements (governed by rainfall distribution and pasture quality mainly) and a high diversity of non-farm income opportunities. In addition, resource management systems were adapted by maintaining valleys as refugia and grazing reserves. One could state that risks were high and safety standards low: large income fluctuations were considered rather normal. In the more humid Sudan zone droughts are less common, and people take fewer precautions to cope with drought. For instance, non-farm incomes are lower and people live in fixed settlements. One could state that here risks are lower and safety standards higher. Here the impacts of minor drought periods were traditionally compensated and attenuated by food reserves and social reciprocity systems, but these precautions were later neglected as external food aid was provided in case of drought. In other words: small shocks did not anymore function to keep the management system resilient. Cattle herds became ever bigger, and in southern areas cash crops were introduced, like cotton, with neglect of soil and water conservation.

Severe droughts in the 1970s caused more damage in the Sudan zone than in the Sahel zone, even if rainfall in the Sudan zone was higher than in the Sahel zone (Reardon et al., 1988). In other words, households were less resilient in the Sudan than in the Sahel zone, due to different risk perceptions and adaptive strategies that were developed and adopted. Unfortunately, more recently the adaptive strategies of pastoralists are also being abandoned, leading to the build-up of greater herds than ever before. This is the result of external influences breaking the pattern of nomadic movement and social adaptation without understanding the resilience of the existing system (Walker and Sinclair, 1990). As a result the situation has become more unsafe while the biophysical context has remained unchanged.

This example also shows that drought (a natural phenomenon) as such need not be a problem, but will cause problems (and increased risks) as a result of complex interactions between human perceptions, external influences and natural events. Human management aimed to make the system more productive and stable and reduce risks, can have contradictory effects by making the production systems less resilient, so that impacts of calamities can be more disastrous.

A similar example is that of lower food security in more productive areas in Kenya (Murton, 1999).

Similar insights come from other parts of the world, for instance lower risks but increasing unsafety for river flooding in the Netherlands. Currently river basins in the Netherlands are increasingly being perceived as unsafe. This has two reasons, firstly safety standards have gone up (and accordingly measures were taken to reach these standards), and as a result perceived risks have gone down (and accordingly people forget about precautions). So if floods do occur, these have greater impacts. The measures taken to control the system to such an extent that high safety standards can be met, have made the system less resilient, so that in spite of more intense human management actual calamities cannot be totally avoided, and when they do occur will be more intense (Geldof, 2001).
Chapter 2 – Socio-ecological concepts

The key to long-term sustainability is resilience, so where we are dealing with complex systems we need adaptive management to meet certain management goals. This includes a well-defined desirable level of resilience. To successfully apply adaptive management, the resilience patterns of the (ecological, social) systems to be managed should be mirrored within the institutions concerned with the management (see Figure 2.6).

What are concrete characteristics of adaptive management systems? First of all, we need principles, rules and organisational arrangements that create suitable conditions for dealing with complex systems by adaptive management. Adaptive management regards management policies or strategies as ‘experiments’. The emphasis is on learning from these experiments to adjust actions (at operational level). This requires monitoring of results and feed-back of lessons learned to policy levels to adjust policies, plans and operations, and responsiveness of management to contextual changes and to monitoring results. Institutions should learn and remember, evolve and adapt, organise and reorganise, in order to perform well in a changing human and environmental context. Emphasis is put on the value of decentralised decision-making to avoid the rigidities of highly centralised institutions with inflexible prescriptions (Mitchell, 2002).

Secondly, the management systems themselves should be adaptive, with structures and processes to adapt to changing conditions, be responsive, supportive and flexible. Thirdly, at the operational level, we need human capabilities and resources to take actions in line with adaptive management. Some of these aspects will be further explored in Chapter 4. Fourthly, adaptive management is not easy, and therefore only useful to apply for managing complex systems. Managing simple or random systems by adaptive management would be a waste of time and efforts.

There is an important link between adaptive management and organisational learning (Gunderson et al., 1995). Two different levels of learning can be distinguished (Fig. 2.13). The first, single loop learning, focuses at solving problems without examining the appropriateness of the current approach or the assumptions. Regular monitoring and evaluation of performance (inputs, outputs, effects) are part of single loop learning, but in addition will need to detect opportunities for change and emerging risks (i.e. a more pro-active monitoring approach). Single loop learning will not lead to a paradigm change or structural change.

The first level of learning is nested in a second level, double loop or organisational (generative) learning, which emphasises an ongoing examination of the way organisations are structured and operate and go about defining and solving problems. Double loop learning requires looking at your own organisation in a changing context. The essential difference between the two levels is between being adaptive within a limited scope (time-bound, paradigm bound, sector bound) and being adaptive in an evolutionary sense (long-term, holistic, large-scale, open-minded). The second loop learning should prevent that management systems become too short-term and target oriented, and unresponsive to long-term societal and environmental trends. Second-loop learning should also take into consideration the fundamental value systems, and not only focus at established norms and standards, and might lead to a restructuring of value systems in a changing context.
Figure 2.13: Two levels of learning nested in each other as elements of an adaptive management approach

Second-loop organisational learning is a well established concept in the management culture, to help companies survive by being flexible and adaptive to changing markets and societal demands. One key capacity required for organisational learning is not getting the right policy but fostering adaptive thinking. Managers/decision-makers must see their task not as devising plans but as fostering learning that allows the organisation to continuously appraise and adapt approaches and policies. Learning organisations learn from feed-back rather than being bound by their past experiences. The generative learning ability of an organisation is not measured by what it knows (that is the product of learning), but rather by how people learns and adapt (the process of learning). This might be referred to as ‘learning to learn’, and could be considered a third learning cycle.

But to guide adaptive management that aims to contribute to sustainable development there are two important considerations. Firstly, there is need for agreement on basic principles and values (Roome, 2001). First-tier values should be defined by the stakeholders involved and be translated into operational norms and standards. It is important to emphasise that experiments in the real world cannot be value-free. Some mistakes would lead to unacceptable risks or irreversible changes. Secondly, there is need for a direction, a long-term vision that helps determine which experiments (as part of an adaptive management approach) are useful, and which are not because they do not lead to a desirable future. The vision will aim to assure a desirable quality of the key values for sustainable development. These are location specific. These two aspects, standards that should be respected and a long-term vision to give direction to a process of change, are essential elements of what I would call ‘guided adaptive management’. It also implies applying the precautionary principle where uncertainties remain with respect to priority values and long-term resilience aspects, to avoid unacceptable changes.
2.6 CONCLUSIONS

The objective of this study is to develop a framework that helps integrate environmental sustainability issues into planning processes. From the present chapter, what are useful building blocks?

1. A key concept to deal with environmental sustainability is long-term resilience. Resilience is the capacity to withstand external shocks and maintain long-term evolutionary adaptation to changing conditions (Fig. 2.2). Other key values of the environment are functional procurement (provision of various goods and services) and functional diversity (including biodiversity).

2. Operationalising resilience means understanding the adaptive cycle of ecosystems and human influences on this cycle, including short moments of apparent chaos (Figure 2.3). Human pressures and stochastic events interact to cause apparently unpredictable flip-overs to other ecosystem structures. Understanding how environmental resilience operates requires looking at scale levels and time horizons beyond our direct interests, where ecological processes governing resilience operate. Here, we can strengthen resilience by reducing human pressures, establishing buffers and reserves, maintaining functional diversity, avoiding rapid changes and installing monitoring and early warning systems. An example is worked out in Box 2.1.

3. Many ecological and social systems that we are dealing with show characteristics of complex systems. These typically have a high level of unpredictability and display self-regulating dynamics. But when looking over longer time periods, we might detect patterns of change, with different equilibrium states and transitions. This may help us understand ecosystem dynamics in relation to natural and human driving forces, and make better predictions about system dynamics and its resilience. Further insights on patterns in evolutionary changes of land-use are explored in Chapter 3.

4. To manage complex adaptive systems, the concept of resilience should be mirrored within the institutions responsible for managing the environment (Fig. 2.6). Adaptive management refers to flexible, diverse and redundant regulation, monitoring that leads to corrective action and experimental probing of the continually changing reality of the external world. Key attributes for adaptive management systems are careful and limited steering instead of controlling, organisational (double-loop) learning and a high responsiveness to contextual changes and societal demands through monitoring and early warning systems (Fig. 2.13). Requirements for maintaining long-term resilience may be contrary to human intuition of maximising short-term constancy and security. Further insights in institutional aspects are developed in Chapter 4.

5. To solve the problem of substitutability of values and forms of capital that are part of sustainable development, we need to define first-tier values (that cannot be substituted, are not subject to cost-benefit analyses) as compared to other values. First tier values and associated norms and standards are morally legitimate in view of the need to maintain biodiversity and long-term resilience and optionality for future generations.

6. Adaptive management regards management policies or strategies as ‘experiments’. The emphasis is on learning from these experiments to adjust actions (at operational level). But to guide adaptive management that aims to contribute to sustainable development there is need for agreement on a vision, critical values and bottom-line standards to help determine which experiments are useful
and which are not. These two aspects give direction and provide boundaries, and are essential elements of what I call ‘guided adaptive management’. It also implies applying the precautionary principle where uncertainties remain with respect to priority values and to avoid unacceptable changes.

7. The problem-in-context (PiC) model appeared useful for the design of an environmentally sound development plan. Through the approach of progressive contextualisation a pragmatic and justifiable approach can be developed. The role of the normative observer is critical, to represent the voice of ‘absent stakeholders’ and raise attention for first-tier values of environmental and socio-cultural nature. Based on experiences with this approach, I emphasised the need to identify promising actions and break-through issues ‘along the way’, ensure participation by innovative and creative actors (e.g. private sector), and assure ‘sustainability relevance’ by looking at root causes, broad spatial scales and relatively long time horizons.

8. Applying the PiC model to define and explain environmental problems, and come to relevant actions, is basically about defining environmental values and standards. Values are generally acceptable principles, for which are required norms and standards to indicate the desirable qualities of these values. These may vary by locality and actor and may change in time. It is important to realise that where (environmental) problems cannot be solved within the context of a certain paradigm (set of values, norms and standards), there may be need for a paradigm shift. Double-loop learning can help achieve such a change.

9. To consider environmental sustainability issues in planning processes, qualitative understanding (e.g. of patterns, driving forces, underlying value systems) is as important as quantitative measurement (e.g. of thresholds, sustainable use levels). Models that may help discern such long-term and large-scale patterns are the four-phased adaptive cycle (Fig. 2.3), the carrying capacity model (Figure 2.4), nested scale levels providing resilience (Fig. 2.5), the components of sustainable development (Fig. 2.6), the model describing the relations between human management and biodiversity (Fig. 2.8) and the Problem-in-Context model (Figures 2.11 and 2.12). The methods and tools for planning processes will be further explored in Chapter 5, and my own experiences will be analysed in Chapter 6, as building blocks for the framework to be developed.
3. PATTERNS AND STATES OF LAND-USE DYNAMICS

In Annex I the empirical evidence is presented that has lead to the conceptual insights with respect to the substance of planning that aims to take into account environmental sustainability issues. These are studies on the dynamics of land-use from different levels, local, regional to macro, and from these studies conclusions were drawn on useful implications for my design framework. These conceptual insights are presented in this chapter 3, with references to facts and conclusions from the case studies presented in Annex I. It has lead to a practical approach that will be called ‘the two-pronged design’.

Although design substance and the overall planning process are intricately related, for the sake of clarity these two aspects will be dealt with separately. The question of actors and institutions involved in decision-making (who does it?) will be dealt with in chapter 4, while the planning and design process itself (how to do it?) will be subject of chapter 5. I will then also clarify that planning in this book refers to the process of formulating a policy, plan or project, consisting of a more analytical and explanatory stage and a synthesis phase which could be called design. In this chapter we deal with the substance of planning and design (what to analyse, what to explain, what to design?).

At several places reference will be made to the studies presented in Annex I, as this provides the empirical basis for the insights that are presented.

Section 3.1. Lessons from the case studies
Here is given a summary of the main lessons learned from the case studies presented in Annex I. These lessons have general applicability, and often refer to patterns in terms of spatial (landscape) changes, and in terms of temporal processes of change.

Section 3.2. Two analytical prongs of the design process
In this section I will draw conclusions from the case studies and justify the need for a two-pronged design process. One prong focuses at a situational analysis, the other at a macro-level analysis.

Section 3.3. The situational analysis
Here the general characteristics and guidelines for a situational analysis are presented, i.e. gaining insight in resources and dynamics of a certain locality.

Section 3.4. The macro-level analysis
This section presents a theory about macro patterns on people-environment dynamics, with characteristic states and transitions. These can be used to derive insights on the position of a certain locality within a more large-scale and long-term (macro-level) context. The insights in underlying human perceptions and main driving forces for each ‘pattern state’ can be used to make better predictions, as part of an environmentally sound design process.

Section 3.5. Conclusions
3.1 LESSONS FROM THE CASE STUDIES

Section 1 of Annex I deals with local management practices of common property resources. Three case studies are presented:
- Grazing systems and reserves in the Yemen Arab Republic
- The management of rangelands in the Sahel region in Western Africa
- The management of woody plants in the Sahel region in Western Africa

The following are the design implications from these case studies:
1. A holistic valuation of ‘the environment’ requires distinction of multiple environmental functions for multiple users. Insight in the dependency of local livelihood systems on environmental functions (material and non-material), both short-term production and long-term resilience, is helpful to gain insight in motivations for local management practices. Common property resources in particular have important supra-local environmental values.
2. There is need to understand how indigenous natural resources management is adapted to local ecological conditions, particularly under conditions of resource scarcity. These insights can be obtained by looking at the adaptability of indigenous practices in the face of change and external disturbances. For that purpose, it is necessary to look over long time spans. These insights are a basis for maintaining or developing adaptive management systems.
3. For design purposes attempts to quantify limitations to resource use will not be helpful. However, one can assess trends, the direction of change and the speed of change, and agree on thresholds of desirable qualities and acceptable change.
4. For design purposes insight should be acquired in the main socio-cultural and institutional factors influencing indigenous management systems, and the underlying causes of change. This generally involves a mixture of endogene and exogene factors. Care should be taken with generalisations.
5. Rational models can help structure the interplay of determining factors, e.g. those explaining decision-making or change processes; attention should also be given to non-rational factors. To obtain insights in non-rational factors monitoring the dynamics of major events influencing resource-use can be helpful.
6. It is useful to make an inventory of local initiatives and innovations for more sustainable resource-use in the face of major change (i.e. the exceptions to predominant trends). The analysis of such initiatives will generate insight in success factors and potential for replication.
7. For design purposes it is useful to analyse the sustainability of ongoing change processes by looking at the 3 key values of ecosystems for human development goals.

Section 2 of Annex I deals with regional land-use dynamics. Three case studies are presented:
- Land rehabilitation in the Sahel region
- An evaluation of the potentials for Low External Input Sustainable Agriculture
- Land-use intensification in resource-poor environments

The following are the design implications from these case studies:
1. For a design to meet sustainability objectives, insight is required in the quality of ecological processes and the way these are managed. If ecological processes are still relatively intact, or can be easily restored, intensification processes have better chances to be successful.
2. Economic conditions at supra-local levels, and their dynamics, strongly influence potentials for sustainable land-use at local levels. This is particularly important for resource-poor environments.
(in view of potentials for capital inputs and off-farm employment). Strong external triggers can avoid land degradation, and stimulate early induced innovation.

3. Apart from ecological and economic factors, there is need to map the social, cultural and institutional factors that influence the current (resource-use) dynamics. Some of these factors are found at supra-local levels. While ecological and economic factors determine land-use potentials, socio-cultural and institutional factors determine to what extent these potentials can be realised.

4. Empirical studies of land-use systems are unlikely to be a sufficient basis for good predictions. Particularly important are insights in underlying motivations and normative perspectives (e.g. on assumed degradation status), and how these are related to land-use dynamics.

5. Rather than looking at design as a one-time event, we should think of an iterative process of monitoring and adaptation, focusing at key factors and sustainability goals. Both environmental aspects (multiple environmental functions at a large scale and with a long-term perspective) and social equitability aspects are important.

Section 3 of Annex I deals with a case study on the forest conversion process in Indonesia. The following are the design implications from this case study.

1. Insight is required in the sectoral driving forces for environmental changes. Root causes are found in various sectors, and involve actor networks at international, national and local levels. Instead of analysing in detail sub-systems (of one sector and/or one level), the focus of an efficient design process should be at critical knots and levers.

2. Spatial patterns at landscape level are useful to understand large-scale change processes and constitute a visual image to raise awareness. Spatial patterns show development frontiers, threats and driving forces in a qualitative manner. These patterns can be better understood when placed in a historical perspective of changing attitudes and economic development stage.

3. In view of the complexity of environmental problems, with complex interactions of factors at multiple levels and actors from multiple sectors, it is not useful to analyse in detail the (sub-) system/s. Instead a more pragmatic and action-oriented approach should be taken, which focuses at an overall insight and then identifying the knots and levers in the system.

4. During planning attention should be given to opportunities for change, in terms of promising initiatives and innovations. This requires an eye for exceptions rather than the normal and average.

Section 4 of Annex I deals with a case study on the influence of structural adjustment programmes on the environment. The following are the design implications from this case study:

1. The presented methodology has the potential to systematically integrate environmental issues into the design of higher level plans or policies, by starting out from the multi-functional resource base. To meet this potential more and better information is required, either through case studies, or through interactive information exchange processes.

2. For every local situation an inventory of the current trends and driving forces at macro levels must be made, and the potential impacts on (fragile) ecosystems and (fragile) social groups must be assessed. Although generalisations are useful to discern patterns, specifics are required to define local solution strategies.

3. To assess large-scale and long-term patterns of change, the 3 key values of ecosystems for human society are useful: functional procurement, functional diversity and resilience.

4. It is important to gain insight in belief systems and development paradigms that prevail among policy makers. The experiences and evidence upon which these belief systems are based might not be generally applicable and might differ from those of local stakeholders.
3.2 TWO ANALYTICAL PRONGS OF THE DESIGN PROCESS

From the case studies in Annex I two components emerge that are relevant for the substance of an environmentally sound design. These are the two analytical prongs of a design process.

1. *The ‘situational analysis’*. Many conclusions from the case studies refer to issues of general validity, but showing great variation between different locations and the people involved. One should take care with theoretical generalisations and simplifications regarding land-use dynamics and their sustainability. Every locality and social group has specific characteristics. Detailed analyses are required not only to specify driving forces and responsible actors, but also people’s motivations, belief systems, rational choices and non-rational considerations.

2. *The ‘macro-level analysis’*. The case studies also demonstrate general patterns, with underlying driving forces and key actors involved. These patterns play at relatively large spatial scales and over long time periods. It is the macro-level context for a specific location. The patterns concern historical changes, current dynamics and future changes, and understanding these may help making predictions. The case studies demonstrated patterns with respect to management of common property resources, agricultural intensification processes, forest conversion processes, or consequences of structural adjustment programmes.

Thus, an environmentally sound design process can be characterised by two analytical prongs (Figure 3.1). The tools and methods required for the two analytical prongs are different. One requires detailed knowledge and analysis of events and experiences, the other requires broad-brush insights of long-term changes and large-scale patterns. Starting at both sides the two types of analyses should meet each other, reinforce each other, and together create sufficient insight for a good strategic design. The following table characterises these differences. Details of the situational analysis are worked out in section 3.3, while the details of a macro-level analysis are worked out in section 3.4.

<table>
<thead>
<tr>
<th><strong>Situational analysis</strong></th>
<th><strong>Macro-level analysis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Insight in local interactions and dynamics, for concrete decision making</td>
<td>Insight in macro patterns, for broad perspective and vision</td>
</tr>
<tr>
<td>Gives broad perspective, structures complexity, reduces ‘trial and error’</td>
<td>Feeds data and information, gives concrete actions and relevant actors</td>
</tr>
</tbody>
</table>

*Figure 3.1: The two prongs of an environmentally sound design process*
Table 3.1: The main characteristics of a situational and a macro-level analysis

<table>
<thead>
<tr>
<th>Situational analysis</th>
<th>Macro-level analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Local issues, endogene factors, micro and meso levels driving forces and stakeholders</td>
<td>▪ Macro patterns, exogene factors, macro-level driving forces, sectors and key actors</td>
</tr>
<tr>
<td>▪ Starting out from local situations, establishing linkages to a broader context</td>
<td>▪ Starting from broad patterns, using case studies, zooming in at key factors</td>
</tr>
<tr>
<td>▪ Detailed analysis of specific events, cases, experiences, successes or failures</td>
<td>▪ Looking at large areas and over long time periods (historical patterns of change)</td>
</tr>
<tr>
<td>▪ Aimed at defining concrete solutions and opportunities</td>
<td>▪ Aimed at acquiring broad insights</td>
</tr>
<tr>
<td>▪ Resulting in concrete plans and decisions</td>
<td>▪ Resulting in a vision, scenarios or predictions about the future</td>
</tr>
</tbody>
</table>
3.3 THE SITUATIONAL ANALYSIS

3.3.1 JUSTIFICATION

The analysis of specific situations is required to design concrete solutions and define concrete agreements with key actors. A situational analysis is also a process that involves key actors to generate trust, commitment and ownership. There are no short-cuts to be made by looking at general patterns only, or by assuming that critical knots and levers can be easily found without thorough understanding of local driving forces and actors. The case studies give evidence of the fact that, although general patterns might be detected, every situation also has very specific characteristics. For instance, local indigenous practices should be thoroughly understood to be able to judge how these operate, whether they are sustainable, how they can be strengthened etc. (see Annex I.3.1).

A situational analysis should also lead to insights about relevant stakeholders and key actors, their values (belief systems), rational and non-rational motivations, norms, sensitivities, networks, etc.. Judgements and predictions are often based on uncritical ‘outsiders’ norms, such as characterised by the uncritical use of concepts like ‘land degradation’, ‘deforestation’ and ‘carrying capacity’. Norms and value perceptions (e.g. of nature and development) are fundamental for defining sustainability.

Box 3.1: Unpredictable and complex land-use dynamics

- **The influence of economic potentials.** Increasing economic potentials of a certain resource may trigger rehabilitation of that resource, like tree planting when firewood or timber markets expand. But the opposite, i.e. more intense exploitation (‘grab it and run’) may also occur, like deforestation when timber prices increase. Likewise, improved off-farm opportunities may generate capital to be invested in agricultural intensification (Machakos case, Yemen case, LEISA situation 3). But off-farm employment opportunities may also discourage farmers to invest in land because alternative income opportunities are more attractive.

- **The influence of profitable cash crops.** The profitability of cash crops may be good or bad for the environment. For instance, growing cotton might be good because its profitability allows farmers to make use of chemical fertilisers, which can have a positive impact on the overall nutrient balance (Van der Pol, 1992). Others emphasise the negative impacts of (excessive use of) fertilisers and pesticides, and the high risks of erosion, cotton being a poor cover crop (Barbier, 1991). The profitability of cotton may also lead to clearing of forests, and tree cutting in parklands to reduce shading, both of which are not environmentally sound if not well placed and planned in a broad landscape context.

- **The influence of poverty.** It is still a common perception that poverty causes over-exploitation and mis-management of the environmental resources. This situation can be observed where local communities have no alternatives, no land rights, etc. But there are plenty of examples showing that the poorest layers of society make most efficient use of natural resources, and are motivated to invest labour in land rehabilitation. Several authors have recently ‘demystified’ the assumed unilateral relationship between poverty and environmental degradation. Market failure and institutional factors are among the most important variables influencing this relationship (e.g. Duraiappah, 1996). It can be postulated that in many cases large-scale environmental destruction is triggered by relatively rich players, such as the case of oil palm plantations in Indonesia shows (see Annex I.3.4). Alleviating poverty will also increase people’s needs and demands for consumption products, and thus increase pressure on scarce resources.

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1 I experienced this paradigm shift during a workshop in Tanzania. At first everyone ‘accused’ population growth and poor communities of causing land degradation. But following a strong plea by one person, more could cite experiences showing evidence of the contrary: poor and female headed households being most receptive to soil conservation proposals.
For a situational analysis social, economic, ecological and institutional issues and their interactions are important to understand. There are rarely unilateral relations between these issues, but usually a complex of factors is involved, with other factors influencing apparently simple cause-effect chains. The situational analysis focuses at the endogene driving forces. The interplay between driving forces shows a considerable degree of unpredictability, so that extrapolations of successful cases are difficult to make, and predictions are seldom correct. Success factors in one situation can have opposite effects in another situation, or have minor importance (see Annex I.3, Table 3.3). Box 3.1 gives some examples of complex land-use dynamics.

3.3.2 CHECKLIST FOR A SITUATIONAL ANALYSIS

The case studies have shown that with respect to the focus of this book at the environment – human society interface, the following elements are important to consider when analysing specific situations as part of a design process. This can be used as a checklist.

- **Define which environmental functions are important for which users.** Pay attention to material / economic and immaterial / non-economic values at local and supra-local levels. Non-economic values include enrichment and cultural functions. [evidence in Annex I.3.1 mainly]

- **Gain insight in key ecological processes, biodiversity values and sustainability standards.** This includes the resilience and fragility of ecosystems, ecological stabilising and buffering processes, their current quality, resilience thresholds and potentials for restoration and optimal functioning. On the basis of these insights define the ecological processes and related biodiversity elements that are critical to maintain environmental sustainability. Critical biodiversity must be defined at species, habitat and landscape levels [evidence in Annex I.3.1 and 3.2]

- **Understand the dependency of livelihood stability and sustainability on ecological processes.** The adaptability and ecological rationale of indigenous resource management systems can be assessed by looking at (historical) adaptations in the face of change and external disturbances or events. It is particularly useful to understand how land-use systems adapt in the face of increasing resource scarcity and external pressures. [evidence in Annex I.3.1]

- **Gain insight in the direction and speed of environmental changes.** Apart from the direction of current changes, the speed of change is important, as rapid changes most easily exceed the ecological and human capacity to adapt. [evidence in Annex I.3.1]

- **Gain insight in key factors determining resource use systems.** This refers to driving forces and underlying causes. These include ecological and economic factors, as well as social, cultural and institutional. Changes of management systems occur on the basis of endogene and exogene driving forces. Take as a guideline the Big Five (Box 3.2). [evidence in Annex I.3.1 to 3.4]

- **Pay attention to non-rational motivational factors.** Apart from ‘rational’ models and determining factors, attention must be given to ‘non-rational’ factors, underlying motivations and normative perspectives with respect to land-use, of the different actors involved. This includes the belief systems and development paradigms for stakeholders and decision makers at different levels. [evidence in Annex I.3.2 mainly]

- **Identify the actors involved at multiple levels.** Victims are often found at local level. Key actors causing undesirable change are often found within productive sectors. Instead of detailed analyses of sub-systems, the focus should be at: key factors and actors within sectors influencing the environmental dynamics, their interactions (either reinforcing or opposing each other), the motivations and mutual interests of key actors and the expected future trends and development scenarios with respect to these key issues. [evidence in Annex I.3.3]
• Identify and analyse opportunities for change and new initiatives. Finding opportunities is fundamentally different from analysing problems. Finding opportunities for change requires a focus at exceptions to predominant trends, areas of conflict or pressure, innovators, innovations and social dynamics. There are internal factors and external forces determining the potential for replication. [evidence in Annex I.3.1 and 3.3]

Box 3.2 The Big Five: key factors and their interactions influencing land-use dynamics

As a rule of thumb, from the case studies that were presented, the following appear to be the five most important factors determining potentials for sustainable land-use. In a situational analysis one could start out by checking these.

1. Ecological potentials and current condition / level of degradation. The potential and actual productivity and resilience of ecosystems are critical in determining the feasibility of investments for improved resources-use (rehabilitation and intensification).

2. Access to markets and economic opportunities. For resource-poor environments in particular, economic conditions at supra-local levels (markets, job opportunities) offer important opportunities for more sustainable resource use. Price levels (the profitability of commodities) are an important parameter.

3. Environmental resource scarcity. This parameter strongly influences the willingness to change land-use and adopt sustainable practices. An important underlying factor is population pressure. Environmental scarcity influences the incidence of human conflicts.

4. Land tenure / resource ownership characteristics. In the absence of clear resource ownership and management arrangements there is little chance that major investments will be made to improve land-use, while control of external pressures will be difficult.

5. Enabling institutional context. This mainly refers to the institutional setting, enabling, facilitating and norm-setting, while leaving room for local decision-making.
3.4 PATTERNS OF CHANGE FOR A MACRO-LEVEL ANALYSIS

3.4.1 JUSTIFICATION

The case studies showed that a local situation cannot be fully understood without insights in its macro-context. This refers to greater spatial scales, to longer time periods (back in history and ahead in future) and to the institutional setting. Macro-level insights helps predict how a situation can be expected to change, and what solutions or support can be effective for a more sustainable development path. Note that the institutional issues will be further explored in Chapter 4.

A macro-level analysis should create insight to put a specific situation in a long-term perspective. Historical dynamics often show patterns with rather abrupt changes. Too often successful cases tend to be extrapolated with insufficient evaluation of the specific driving forces and historical context, and without placing the success in a more broad development context. Understanding macro-level patterns of change and the underlying driving forces will help make more realistic predictions and reduce the amount of ‘trial and error’ by placing each situation in a certain time (historical) and spatial context. This is a major challenge of a good design process.

Insights in the macro-level context will help identify for specific situations good opportunities and comparative advantages. In resource-poor environments with limited economic potentials, development options often depend upon potentials beyond the local situation (e.g. urban markets, tourism potentials) – see Annex I.3.2 for Sahel region. In resource-rich environments, major threats often originate from supra-local levels (e.g. forest conversion and land encroachment) – see Annex I.3.3 for forest conversion by oil palm expansion. Insights in large-scale patterns will avoid coming up with solutions that are based on local optimism or assumed stability domains. For instance, proposing all communities in a certain area to generate incomes by producing crops for a limited urban market is not feasible. Based upon a large scale picture of variable potentials, localities can decide to specialise using their comparative advantages.

The case studies in Annex I also provide tools and methods to understand broad patterns, such as:

- The adaptive cycle, with patterns in time on land-use changes, e.g. classified as periods of exploitation, degradation, restoration and intensification – see Figure 2.2 and Annex I.3.2.
- Patterns with respect to the three key values for ecological sustainability: functional procurement, functional diversity and resilience, and their relation to human development goals – see Figure 2.7 and examples in Annex I.3.1 and I.3.4.
- Spatial patterns at landscape level, e.g. with forest frontiers, urbanisation, migration patterns, exploitation intensities, ownership patterns, threats and driving forces, in a historical perspective – see Annex I.3.4 and Figure I.3.3.
- Functional relations between key actors at different levels, creating synergy that leads to resource degradation, such as demonstrated for the forest conversion study and illustrated in Annex I.3.4 (Figures I.3.4 and I.3.5: the resource-trade-cycle model).
I will here briefly review four theories dealing with large-scale and long-term patterns of change, without the claim to be comprehensive, as building blocks to my own framework.

1. **Geographical location theory**
   In terms of spatial patterns, the geographical location theory of Von Thünen (1826, 1966; in De Groot, 1999b) is still very relevant. He found certain patterns of land-use zones situated around an urban centre, including (Figure 3.2):
   1. An intensively used zone immediately around the urban centre (e.g. for horticulture, dairy), characterised by high investments (of labour and inputs), generating high revenues per unit of area
   2. An extensively used zone (e.g. slash and burn), with limited investments, mainly grain crops and livestock grazing for meat production, generating limited revenues per unit of area
   3. An extraction zone (e.g. of forest products), of products that can be easily harvested and transported, to generate incomes when exported to the urban centres
   4. A zone with relatively intact nature, used for hunting and gathering by low population densities, for subsistence needs mainly.

   These patterns are relatively predictable, as they are based on a micro-economic rationale of profit-maximising by individual actors, determined by factors such as accessibility, available infrastructure, distance to the market, perishability of products, transport costs, land-use potentials, etc. These patterns are scale independent, they can be found around small villages as well as large economic centres. Figure 3.2 shows how these patterns can be nested in each other at different scale levels.

2. **Population – environment dynamics**
   A second perspective focuses at patterns in time rather than in space. It is generally accepted that population increase leads to pressure on natural resources, increasing scarcity of preferred resources and as a result a falling benefit-cost ratio. Note that degradation is here defined as the loss of specific
environmental functions (goods and services) in terms of their quantity and/or quality. This definition implies that a situation might be degraded in one sense (e.g. in terms of soil productivity), while not being degraded in another sense (e.g. potentials for tourism in an eroded landscape).

The critical question is when and how people will adapt to a new situation of environmental pressure. Roughly three different paths are possible if environmental scarcity increases (Figure 3.3):

1. **Transition or induced innovation (the optimist view).** This implies that as resource scarcity causes the land-use system to become less efficient, technological and institutional changes will take place to make more efficient use of scarce resources, and/or use other resources, and/or develop incomes not based on land-use (social services, ecological release). The theory of agricultural transition (Boserup, 1965) emphasises how population growth leads to scarcity which stimulates harder work, labour specialisation, improved cropping practices, capital inputs and increased productivity. It leads to a process of agricultural intensification by which yields may greatly increase. The theory of induced innovation (Hayami and Ruttan, 1985) emphasises the role of market price signals which stimulate technological innovation and institutional change to overcome constraints on growth. An example is the Machakos case (case study in Annex I.2.2).

2. **Partial rehabilitation.** This implies that the same occurs as indicated above, but it happens too late or too incomplete for rehabilitation of the resource-base. With partial rehabilitation the productivity of the system at a new equilibrium stage will be sub-optimal (i.e. lower than the original system). This phase is intermediate between paths 1 and 3. An example is some parts of the Sahel region (case study Annex I.2.1).

3. **Collapse or involution (the pessimist or Malthusian view).** This implies that no changes in land-use practices take place, and productivity declines to such a low level that people will abandon the area. This may occur because of ecological reasons (irreversible land degradation, e.g. landslides, loss of topsoil, loss of biodiversity, etc.), human reasons (conflicts) or institutional reasons (access to resources). An example is Rwanda, leading to the violence in 1994 (Gasana, 2002).

![Figure 3.3: Possible development paths triggered by population growth and resource scarcity: (a) transition / induced innovation, (b) partial rehabilitation, (c) involution (based on Hayami and Ruttan, 1985).](image-url)
Table 3.1: The relative influence of endogene and exogene factors on optimist or pessimist development paths

<table>
<thead>
<tr>
<th>Predominance of endogene factors</th>
<th>Optimist development path</th>
<th>Pessimist development path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boserup: transition due to change of endogene factors</td>
<td>Malthus: collapse due to endogene population growth</td>
<td></td>
</tr>
<tr>
<td>Predominance of exogene factors</td>
<td>Liberal view: induced innovation due to open markets</td>
<td>Neo-Marxist view: involution due to capitalist resource extraction</td>
</tr>
</tbody>
</table>

There are both endogene and exogene factors (driving forces and associated actors) which determine whether a pessimist or optimist path will emerge (see Annex I.3.1 and I.3.2). Endogene factors include local socio-cultural and institutional factors, exogene factors include economic and political factors operating at macro levels. Four theories can be distinguished (Table 3.1), based on the relative importance given to endogene or exogene factors, and whether an optimist or pessimist development path predominates. Currently, the liberal (optimist, exogene oriented) view is dominant.

The currently predominating rationale explaining resource dynamics is an economic one. Under conditions of resource abundance there is no incentive to develop efficient land-use systems. As a result, resource degradation occurs until a level of resource scarcity is reached where productivity becomes so low that investments in rehabilitation and intensification become profitable. According to the current view this transition is triggered by profitable markets. However, according to the Boserup transition theory, endogene factors like population growth and resulting labour availability, infrastructure development, higher levels of organisation, specialisation, urban development, etc. are more important. Looking at it in a negative way, a certain period of land degradation seems inescapable. Looking at it in a positive way, in most cases the development path appears to be self-correcting, as degradation will be followed by rehabilitation and intensification through inputs of human and capital resources.

Both endogene and exogene factors are involved in explaining these dynamics. Unfortunately, there is currently a general tendency to downplay the importance of endogene factors like the environmental resource base (Homer-Dixon, 1999). This is incorrect, as has been demonstrated through several case studies (e.g. see Annex I.3.2). This view is a reflection of the currently prevailing paradigm that puts economic growth through open markets and technological change upfront and neglects cultural and other non-rational motivational factors (section 2.4.4).

3. Environmental scarcity and land-use conflicts
Homer Dixon (1999) emphasises the role of environmental scarcity as one important factor causing human conflicts, particularly in poor developing countries. The incidence of violence will greatly frustrate ingenuity and induced innovation trajectories, and may thus lead to the path of collapse (pessimist view).

There are two mechanisms by which conflicts can arise from environmental resource scarcity:
1. **Resource capture.** This occurs when the degradation of a resource interacts with population growth to encourage powerful groups within a society to shift resource distribution in their favour. These groups tighten their grip on the increasingly scarce resource base and use this control to boost their wealth and power. It intensifies scarcity for poorer and weaker groups in society. This mechanism appears to occur with certain common property resources that become private property (see Annex I.3.1).
2. *Ecological marginalisation*. This occurs when unequal resource access combines with population growth to cause long-term migrations of people dependent on renewable resources for their livelihood. They are then forced to move to ecologically fragile regions (e.g. steep slopes, areas at risk of desertification, wetlands prone to floods). High population densities in such areas may cause severe resource degradation. This mechanism can occur for certain social groups even in situations where a process of agricultural intensification and transition prevails (see Annex I.3.3).

4. Integration or incorporation of local economies

Sooner or later every locality will get involved in market economies, at ever increasing scales from regional to national and global levels. With respect to the relations between market economies and the inhabitants at a certain locality, two situations can be distinguished (based on Kleinpenning, 1991). These situations have largely contradictory effects on the potentials for sustainable development.

1. **Incorporation** refers to the area being annexed or absorbed by a national or global economy, without local inhabitants having any influence on the process. It leads to loss of autonomy and social cohesion of local communities. There is no reflux of capital to the area where resources are being exploited. It generally ends up with a situation that is (environmentally and socially) unsustainable. The study on forest conversion and oil palm (see Annex I.3.3) is a good example. Structural adjustment programmes promoting export oriented growth can have such impacts (see Annex I.3.4).

2. **Integration** refers to the area and its inhabitants being ‘integrated’ in a national or global economy, i.e. becoming part of a larger whole, which would empower them, socially, politically and economically. The process is partly based on the interests of the local communities, and would serve their development goals. There is a reflux of capital from the local, national or international economy to the area and its communities, which can be used to manage the resource base. The study on agricultural intensification in Machakos area (see Annex I.3.2) is a good example.

3.4.3 A COMPREHENSIVE THEORY ON MACRO-LEVEL CHANGE

The temporal changes as outlined in theory 2 can be matched with the spatial pattern of land-use zones of theory 1, by introducing the urban centre as a trigger for transition (or induced innovation). Once the locality has reached a certain constellation of endogene factors (ready for change), the urban centre may play its role as an important exogene factor making possible (triggering) transitional change. Firstly this happens in the vicinity of the urban market. Furthest from the market centre we find either nature areas (with low population densities) or involution (if population densities are high). Thus, different development paths or land-use patterns may exist along side each other².

The model can be made more dynamic by assuming that urban centres and markets expand (De Groot, 1999b). This leads to an evolutionary perspective, whereby one place is located in successive (expanding) land-use zones over time. These dynamics are not limited to expanding urban centres. The example of the forest conversion process (Annex I.3.3, Figure 3.3) shows how this expansion can proceed through advancing frontiers of agricultural expansion, triggered by profitable markets and stimulated by some local conditions. The resource-trade-cycle model (Annex I.3.3, Figure 3.5) shows the motor fuelling this evolutionary change, with key actors operating at a global scale.

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² Turkenboom (2001) gives an example for Bhutan: in some villages there is evidence of agricultural innovation, in others partial rehabilitation, in other regions there is a tendency of out-migration when the area has been degraded. Accessibility to markets is one factor explaining these differences.
Theories 3 and 4 can now also be integrated. Incorporation processes cause resource destruction and local poverty (no investments of profits made, no innovation), leading to migration and involution processes. Integration processes are supportive to induced innovation and transition processes. But successful integration and transition processes can be accompanied by ecological marginalisation of certain social groups (e.g. women, ethnic groups, migrants). At a spatial scale, migration leads to increasing pressure elsewhere, and may result in conflicts, particularly where the resource base is already limited. This leads to spatial patterns opposite to that of Von Thünen (Fig. 3.2).

Hence, spatial zones shift and expand, and in this way generate successions in time of different types of land-use at one place. These are ‘land-use states’. For a certain point in time (a snapshot) different land-use state can be identified on a map. For a certain locality, one can also describe the evolution of different land-use states as a historical process of change (like successive waves). Land-use states can be considered as stability domains (section 2.2) with respect to the balance between needs and demands of people, the functional procurement (of goods and services) by the environment, and the related level of functional diversity and resilience. Transitions between land-use states can be considered as the passing of resilience thresholds.

Looking at the adaptive cycle of Holling (1995) in Figure 2.2, one can visualise the transitions between land-use states. The adaptive cycle normally causes land-use states to adapt to changing conditions. This involves minor changes within a certain land-use state constellation. However, if conditions strongly change (e.g. population pressure, market demand) a new land-use state might emerge. In that case, following the phase of rapid release, the elements are reorganised in such a way that a different (new) land-use state develops. A minimum of release (collapse) seems necessary to allow restructuring. This shift of state is associated with a period of crisis.

What drives the changes between land-use states? It was made clear that both endogene and exogene factors play a role. Increasing population densities, people’s ingenuity to create innovations and external economic triggers (from urban centres or markets) are important driving forces. Important conditions for transition to occur are integration of economies into local livelihoods, a sufficiently productive and resilient natural resource-base, favourable land and resource tenure, absence of serious conflicts, and policies that are not obstructive to change.

The speed of change of driving factors is important. Where local population growth is accelerated by the influx of migrants (e.g. from areas with high population pressure), the speed of change easily outpaces potentials for adaptive change (both mentally and institutionally). The adaptive cycle then becomes too constrained as there is insufficient time for each of the four phases of the adaptive cycle to develop (section 2.2). As a result, there is no reorganisation towards another land-use state, but chaos, collapse or involution.

In the above theories, the emphasis has been placed on rational driving factors and rational choice theory. However, in several case studies presented in Annex I non-rational factors apparently strongly influence human behaviour. In fact, belief systems are a strong determinant for decision-making, for instance with respect to land-use changes. De Groot (1999b) worked out the different perceptions of nature associated with land-use zones.
3.4.4 PATTERNS AND LAND-USE STATES IN THE DEVELOPMENT PROCESS

The existence of certain land-use states, their transitions in time and the insights in underlying driving forces, are helpful for a macro-level analysis that captures large time spans and spatial scales. States and transitions form certain patterns. For any region, a pattern will constitute of a number of distinct states and transitions with respect to society – environment interactions. These have both a temporal and spatial dimension, as states follow each other up in time, come in waves and partly overlap in a spatial sense.

I have distinguished seven land-use states with respect to the interactions between people and the environment. These land-use states form a sequence of evolutionary change that appears to present itself in different parts of the world (Fig. 3.4). The insights are based on the case studies were inspired by the theories presented above. Particular use has also been made of the works of Ruthenberg (1980), on the evolution of farming systems in the tropics, of Hyden et al. (1993) on population growth and agricultural change in Africa, and of De Groot (1999b), on spatial patterns in the use of the environment and concurrent human perceptions of nature.

The distinct land-use states are briefly characterised in Table 3.2 and described hereunder. Each state is described by the following three issues:

- **Human perception to nature** (based on De Groot, 1999b). Whether belief systems contribute to transitions between land-use states, or actually result from such transitions, is not important. The point is that different belief systems are characteristic for different land-use states, and help develop and stabilise these.

- **An indication of environmental sustainability**, based on the three final values for environmental sustainability (section 2.2). Land-use states vary greatly with respect to their environmental sustainability, and thus environmental vulnerability.

- **Opportunities for a desirable transition**. This is an action-oriented perspective, focused at enhancing environmental sustainability of each land-use state.

More details on characteristics and transitions between land-use states are given in the descriptions starting on page 57.
Table 3.2: Land-use states of society – environment interactions, with underlying human perceptions, sustainability status and opportunities for desirable transition (see for details description of states)

<table>
<thead>
<tr>
<th>Land-use states</th>
<th>Underlying human perceptions / belief system</th>
<th>Indication of environmental sustainability</th>
<th>Opportunities to enhance sustainability of the state</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nature and people in original harmony</td>
<td>Nature seen as an intimate friend, humans are part of nature, spiritual basis</td>
<td>Ecosystems largely intact, maybe slight changes</td>
<td>• Local communities involved in management and benefiting from protected areas</td>
</tr>
<tr>
<td>2. Extraction of selected (high-value) natural resources</td>
<td>Nature seen as economic resource, 'grab it and run', opportunity to get rich, no management, weak dependency</td>
<td>Disturbance is high intensity / low frequency or localised, decline in diversity for selected products may trigger more systemic change</td>
<td>• Protection status for intact areas, with strong legal measures • Co-management with local communities of protected areas • Ecosystem management • Valuation of ecological services</td>
</tr>
<tr>
<td>3a. Extensive land-use by rapid expansion</td>
<td>Nature seen as enemy, as a stand in the way, to be controlled and conquered</td>
<td>Disturbance is high intensity / high frequency, expanding frontiers, decline in diversity and resilience</td>
<td>• Alliances with local communities to protect nature • Participatory land-use planning with buffer zones and reserves</td>
</tr>
<tr>
<td>3b. Stable extensive land-use</td>
<td>Nature seen as a non-intimate friend, nature as a helper, source of life, links to natural elements</td>
<td>Disturbance is moderate intensity and high frequency, critical processes and biodiversity are well managed</td>
<td>• Support for intensification in production areas, with protection of marginal lands • Income generation from sustainable management of relatively intact areas</td>
</tr>
<tr>
<td>4. Intensive land-use with low external inputs / semi-urbanisation</td>
<td>Nature seen as alien, to be domesticated, controlled. Some dependency remains as human control capacities are limited.</td>
<td>Disturbance is high intensity and high frequency, considerable decline in diversity and resilience</td>
<td>• Technology improvement for higher efficiency, subsidies and support for external inputs and land rehabilitation • Poverty alleviation and off-farm employment to reduce pressures • Management rights for local users</td>
</tr>
<tr>
<td>5. Intensive land-use with high external inputs / urbanisation</td>
<td>Nature almost forgotten and totally controlled, linkages hardly exist, high management inputs.</td>
<td>Disturbance is very high intensity and high frequency, major decline in diversity and resilience</td>
<td>• Land-use planning, rehabilitation and protection of marginal lands • Diversified landscapes and land- • Economic measures to avoid excessive use of external inputs</td>
</tr>
<tr>
<td>6. Restoration or protection of selected resources for economic purposes</td>
<td>Nature rediscovered as an economic value, selected natural elements and ecological processes are restored, no surprises</td>
<td>Restoration measures are being taken, some increase of natural diversity and resilience</td>
<td>• Subsidised restoration of ecological processes with economic rationale • Tourism and recreation potentials • Co-management and benefit sharing of restored natural systems</td>
</tr>
<tr>
<td>7. Restoration or protection of nature; immaterial and spiritual needs (new harmony)</td>
<td>Nature as a friend and for inspiration, intrinsic nature values, large-scale restoration, controlled wilderness, surprise is OK</td>
<td>Further large-scale restoration measures are being taken, further increase of natural diversity and resilience</td>
<td>• Subsidised large-scale restoration • Valuation of human emotional and new spiritual values for nature • Co-management and benefit sharing of restored natural systems</td>
</tr>
</tbody>
</table>
Land-use state 1: Nature and people in harmony
This state is characterised by almost intact natural ecosystems, little human influence, possibly low intensity / extensive use by indigenous communities, e.g. gathering of non-timber forest products, hunting and small gardens. Population pressure is very low. There are no significant changes in environmental functions, ecological processes are intact and resilience is optimal.

Land-use state 2: Extraction
Extraction is focused at selected natural resources and generally is destructive, without any measures to restore the resource base (‘grab it and run’). Examples are logging, trapping, poaching, soil mining by cash crops (e.g. soy beans, cotton), mining of minerals. Population pressure is low, but extraction generally aims to serve a profitable external market for certain high value resources. The revenues are required for political and/or economic purposes. There may be some revenues for indigenous people, but subsequent economic progress will stagnate as the preferred resources are being exhausted. Extraction might be relatively easy (e.g. poaching of certain animal species) or require financial investments (e.g. logging of preferred timber species). In the latter case funds may be provided by external sources (see Annex I.3.3). The profitability will be less as areas are more remote and inaccessible and the resources less valuable. In primary forests road construction is often the first industrial activity to improve accessibility, followed by selective logging of high value timber.
Extraction usually comes in temporal and spatial waves, triggered by political and/or economic driving forces. Structural adjustment programmes triggered new extraction waves in developing countries, by promoting export from extractive sectors, while dismantling management institutions (see Annex I.3.4). The availability of financial resources can also trigger extraction waves.

As a result, the preferred resources or goods may become rare, or even extinct, causing systemic change if key-stone species are involved. Whether natural processes are still intact depends upon the intensity and frequency of the extraction waves, and whether any revenues are being (re-)invested to develop a sustainable management system. Unsustainable extraction is often stimulated by conditions of resource capture and incorporation (section 3.4.2), leading to conflicts and poor conditions for sustainable land-use. Integration may lead to sustainable management systems using revenues from extraction to manage the resource base, e.g. for hunting, fishing, tourism or mining at sustainable use levels.

Land-use state 3a: Extensive land-use\(^3\) by rapid expansion
This state occurs where unsustainable extraction is followed by a rapidly expanding agricultural frontier. It is associated with infrastructure opening up the new lands, and a rapid build up of population pressure by waves of immigration (originating from saturated areas or from urban centres with high unemployment rates). The production systems are not efficient and mainly make use of large areas of land, acquiring production increases by expansion mainly. Gradually more marginal lands may be taken into production (e.g. valleys, slopes, marshes, etc.). As a consequence people are forced to make a living in ecologically fragile environments. Impacts result from high intensity land-use practices. Land degradation is not considered a major problem as long as there is enough land available. It is not feasible to make any investments in improved resource efficiency, as the rate of return is low or uncertain, and land tenure is insecure. Apart from the high population pressure, immigrants do not feel attached to the new lands, and may have poor agricultural knowledge, leading to highly destructive and unsustainable agricultural practices. The focus is clearly at short-term survival and profit-making.

Natural elements are basically seen as a stand-in-the-way for exploiting the newly available lands. This is strengthened by the absence of historical linkages with the land. Indigenous communities are considered backward and are often pushed away or marginalised, possibly leading to conflicts. Nature-based belief systems are considered a stand-in-the-way. The situation can be characterised as the ‘wild west’, as one may encounter in Brasil or the Philippines. Immigration may stop, or the reverse may take place, by urban migration. However, if urban employment remains poor and high profits can be made by serving accessible urban or export markets, the agricultural frontier is not easily stopped.

Land-use state 3b: Extensive land-use by stable communities
Alongside extraction processes, or following extraction in historical (e.g. colonial) times, or in the absence of any extraction if valuable resources are not available, one encounters relatively stable subsistence-based extensive land-use systems. Here production levels are low, and no external inputs are used. This situation prevails in many resource-poor environments, such as in the Sahel region. This state might shift to the next state where external inputs are being used, albeit at low levels.

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\(^3\) Extensive land-use can be characterised as land-use with low productivity, while intensification refers to the increased utilisation or productivity of land currently under utilisation (Hyden et al., 1993).
In this state one typically finds remnants of traditional nature-based belief systems, e.g. sacred forests, sacred animals, traditional rules with respect to protection of critical areas, etc. These rules and beliefs often have an ecological rationale. They result from long periods of narrow attachment to the land and its nature. There is a sense of vulnerability versus environmental events, there is no perception of ability to control nature, nor is there a notion of resource scarcity.

However, due to the strong dependency on natural resources, and historical bonds with the land, the use of the environmental resources and ecological processes is not destructive, but careful. Ecological processes are little influenced, but effectively used as they are. But due to their spread over large areas and long time periods this has considerable ecological impacts. In most cases, a patchy landscape occurs, with remnants of relatively untouched natural ecosystems where fragility is high and production potentials are too low.

**Land-use state 4: Intensive land-use with low external inputs**

As population pressure increases and land resources become scarcer, more labour is invested to develop management practices that make more efficient use of scarce resources. This is associated with a change of nature perceptions and traditional management arrangements, focused at economic efficiency and characterised by high labour inputs by both men and women. Alongside traditional leaders there are innovators making more efficient use of available resources, through techniques well adapted to the local ecological context. Where environmental scarcity has gradually increased, highly efficient subsistence-based agro-sylvo-pastoral systems can develop, efficiently reinforcing ecological regulation processes, such as recycling of nutrients, water harvesting, forest regeneration, pest control etc.. These systems are still relatively closed, i.e. have low external inputs, commercialisation of products and outside influences. They are often found in a context of semi-urbanisation, with a gradual increase of urban demands allowing the use of low levels of external inputs.

There are critical ecological thresholds to this state, which may be referred to as ‘thresholds of intensification’, or the ‘low level equilibrium trap’ (Ruthenberg, 1980). If pressure further increases, due to population increase or outside influences, the system may collapse, by soil erosion, deforestation, soil mining, over-grazing, etc. These changes may be more or less resilient, depending upon the fragility of the ecosystem.

Relatively stable (semi-)indigenous subsistence based land-use systems involve various degrees of integration of trees and areas with natural vegetation, to maintain ecological regulation processes. In most cases a patchy pattern appears, including vegetation with various degrees of naturalness. Natural restoration processes are intact to some extent, and a certain level of biodiversity is there in association with critical ecological processes. If pressures increase beyond the ecological thresholds, degradation occurs with loss of diversity and resilience. This situation is often caused by major outside pressures.

**Land-use state 5: Intensive land-use with high external inputs**

To support growing populations or production demands there is need for intensified external relations, in terms of inputs to increase the production capacity of the land, and revenues to make livelihood systems less dependent on local resources. This change might be referred to as ‘ecological release’ (Ruthenberg, 1980). It is basically an escape from the limitations of the local resource-base. This is often associated with nearby urban markets and increased commercialisation to support innovations

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4 A critical population density for relatively efficient land-use systems that do not use external inputs could be set at a maximum of 100 inhabitants per km² for savanna areas (Meertens et al, 1996).
and allow investments to be made for upgrading the resource base. The transition can be triggered by the development of urban areas, or at a larger scale by global markets. Thus, the system becomes more open. There are also important influences through education, improved infrastructure and social services.

Intensification processes may be more or less environmentally sustainable. Whereas in the previous states depletion of natural resources (over-exploitation) is the main problem, in this state destruction (for urban and industrial development) or pollution become important threats. In many cases the last areas with remaining vegetation are cleared, and the landscape transforms from a patchy pattern to large scale agro-industrial monocultures. Natural ecological processes are largely destroyed, the system becomes more dependent upon management inputs. Whether the situation is environmentally sustainable or not depends much upon whether the increasing commercialisation and marketing of products shows characteristics of incorporation or integration (see section 3.4.2). Where incorporation processes prevail, local producers become more dependent upon external factors, with subsequent loss of autonomy. This refers to what can be called the ‘ecological suicide trap’, whereby the natural resource base is destroyed by excessive use of external inputs, pushed by increasing indebtedness and poverty.

During intensification processes, dependency on natural capital gradually shifts to dependency on man-made capital inputs. This implies a decline of cultural diversity (often with socio-economic implications such as reduced equity), and a shift of vulnerability from natural to economic catastrophes or events. There is an implicit belief that nature can be fully controlled through man-made capital. The concurrent process of urbanisation leads to a further estrangement from nature.

Land-use intensification is focused at areas with relatively good ecological conditions as here returns to investments are best. Thus, where the ecological resource base has been depleted rehabilitation of high potential areas may be feasible. Subsidies for rehabilitation during a transition period might be feasible and justified from a regional and global environmental and social point of view. In addition, the pressure on marginal lands may be released, or these may be taken out of production, which offers opportunities for restoring natural landscapes and ecological processes. This is associated with out-migration from areas with low productivity, if intensification and urbanisation take off successfully. However, in many developing countries the common property resources including low-potential areas continue to play a significant role in the survival strategies of the rural poor (e.g. in India: Jodha, 1986). Also, as a result of structural adjustment programmes, employment in urban areas has frequently declined, leading to an increased dependency of urban people on subsistence agriculture.

**Land-use state 6: Restoration of natural resources and processes for economic reasons**

Restoration of degraded land may occur as a ‘turnaround’ process of rehabilitating certain environmental resources or processes, when economic growth continues and cities grow larger (Rudel, 1998 for forest areas). It is associated with a slow rate of population increase and a highly urbanised population. It occurs, for instance, by reforestation of degraded lands, for economic purposes of

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5 Around urban centres, such as Kano, Nairobi and Dakar, a mixture of intensive farming has developed over time, which triggers intensification and innovation processes (Mortimore, 1989; Rey et al., 1996). The same principle operates at a larger scale as Western markets trigger economic growth in developing countries.

6 Where ecological potentials are relatively good, the returns to investments and external inputs are highest. For instance, this is reflected in the yield return ratio (YRR), which indicates the production increase due to the use of external inputs. The YRR is highest where soil organic matter contents are relatively high.
producing valuable timber or non-timber products. Reforestation can also occur for purposes of watershed management or recreation by urban communities. However, the gains in reforestation (by area) are usually much smaller in magnitude than the area lost. As a result, biodiversity and resilience values cannot be (completely) restored, particularly with respect to tropical forests and species requiring large natural ecosystems.

In this state the economic rationale of restoration prevails. There are both direct and/or indirect economic benefits to be obtained from restoration of degraded ecosystems. Examples of direct benefits are revenues from tourism and recreation by urban populations. Examples of indirect benefits are the restoration of ecological processes such as flood control in wetlands, forests for carbon fixation, mangroves for fishery nurseries and capture of sediments, vegetation for capture of dust, etc. It also refers to benefits from nature elements in urban vicinities. Many of these indirect benefits contribute to risk reduction, where human management inputs have become excessive, inefficient or inappropriate. Restoration in this state characteristically focuses at selected elements of ecosystems (see Fig. 2.9), often at a limited scale, and not at restoring complete ecosystems. The process of restoration is well controlled and planned.

**Land-use state 7: Restoration of nature for immaterial needs**

This state is a logical follow-up on the previous state, as immaterial needs gradually receive more attention. It is associated with a high level of urbanisation, and the increasing recognition that immaterial needs contribute to human and societal physical and mental well-being. There is renewed interest by people in the recreational and spiritual values of nature. This links up to the movement and thinking of biophilia, the essence of which is the degree to which people acknowledge that nature has intrinsic value, i.e. value independent of nature’s usefulness (functions) for humans (Kellert and Wilson, 1993). It is based on both enlightened self-interest a sense of other-centredness, morally ‘true love’ (De Groot, 2002). This subject will be further explored in section 7.4.2.

In this state the restoration processes are typically more large-scale and not based on a cost-benefit analysis with an economic rationale. Whereas in the previous state 6 detailed ecological networks might be created for well defined societal purposes, in this state there is room for autonomous ecological processes to operate in large areas and over long time spans. There is increasing space for wilderness and natural surprise.

The restoration processes in states 6 and 7 are different from land rehabilitation in states 4 or 5, where the focus is at an equilibrium for sustained use levels, by making better use of ecological processes. In this state we are dealing with restoration of natural biodiversity and natural landscapes over large areas and long time scales. It is associated with the interest in nature by urban populations mainly (De Groot, 1999b).

Both land-use states 6 and 7 are based on empirical evidence from developed countries. For tropical countries there is so far limited evidence of such restoration processes, and no evidence to assume that tropical deforestation will stop when a country reaches a certain level of affluence (Barraclough and Ghimire, 2000). One could state that the efforts and investments made for nature conservation (e.g. through protected areas) in developing countries are a reflection of a changing mentality in developed countries (in line with states 6 or 7), and being transposed to developing countries where relatively intact nature still exists.

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7 For instance, in Pokhara region in Nepal croplands at sites with marginal soil conditions such are being abandoned and left fallow as other income opportunities become available, mainly from tourism (Shresta, 1998).
Chapter 3 – Patterns and states of land-use dynamics

3.5 CONCLUSIONS

The case studies in Annex I were analysed to gain insight on the substance of an environmentally sound design. Two components emerged: the situational analysis and the macro-level analysis. These two analytical prongs are both required to adequately take into account environmental sustainability issues within a design process (Fig. 3.1).

The situational analysis is required for location specific insights, solutions and agreements with key actors. Every situation has its specific problems and opportunities for change. A situational analysis must look at the social, economic, ecological and institutional issues that are at stake and how these interact. There are rarely unilateral relations between these issues, but usually a unique complex of factors is involved, with other factors influencing apparently simple cause-effect chains. Section 3.2.2 gives a checklist for a situational analysis.

A macro-level analysis is required to put the local situation in its broad context. To understand the macro-context it is useful to discern patterns playing at relatively large spatial scales and over long time periods, and understand the driving forces and actors involved. Understanding macro-level patterns will help make more realistic predictions and reduce the amount of ‘trial and error’ by placing each situation in a historical and spatial context. It will help identify strategic orientations and comparative advantages for specific situations. In resource-poor environments with limited economic potentials, development options often depend upon potentials beyond the local situation, while in resource-rich environments major threats often originate from supra-local levels.

To identify and describe general patterns of land-use change, I reviewed four relevant theories:

1. Geographical location theory of Von Thünen (1826, 1966; in De Groot, 1999b);
2. Population – environment dynamics, with three different response mechanisms to resource scarcity: transition or induced innovation (the optimist view), partial rehabilitation, and collapse or involution (the pessimist or Malthusian view) (Boserup, 1965; Hayami and Ruttan, 1985);
3. Environmental scarcity and land-use conflicts (Homer Dixon (1999), influenced by processes of resource capture or ecological marginalisation;
4. The development of local economies (based on Kleinpenning, 1991), influenced by processes of incorporation or integration.

Integrating these four theories leads to a picture of land-use states and their evolution in time. They relate to each other and evolve in time like successive waves. The land-use states are like stability domains, with transitions in between that involve the passing of resilience thresholds. This is in line with the adaptive cycle presented in Chapter 2. Driving the changes between land-use states are both endogene and exogene factors, such as increasing population densities, people’s ingenuity to create innovations and external economic triggers (from urban centres or markets). Conditions for transition to take place are integration of economies into local livelihoods, a sufficiently productive and resilient natural resource-base, favourable land and resource tenure, absence of serious conflicts, and policies that are not obstructive to change.

Based on empirical evidence from the case studies and literature I identified seven land-use states (see Fig. 3.4 and Table 3.2). These land-use states were described and characterised by their spatial patterns, the major driving forces, the actors involved, the environmental sustainability aspects, the opportunities for a desirable transition, and the associated human perception to nature (based on De Groot, 1999b). During a design process, the land-use states may serve as a reference for understanding large-scale and long-term dynamics. They can help understand the locality in its macro-context, anticipate upon expected changes and thus identify strategies to improve environmental sustainability.
4. ENVIRONMENTAL INSTITUTIONS AND GOVERNANCE

The preceding chapter was focused on substantive issues, exploring the types of questions that will have to be addressed by a framework to support design-for-sustainability. Put in more general terms, environmental management requires appropriate policy content, based on insights in problems, their impacts, their causes and ways of addressing these. All this work of analysis, design and implementation will have to be carried out by institutions, and it is on these and the decision-making processes involved that the present chapter will focus.

If institutions fail, environmental management will never take off. Therefore, we need insights in problems associated with institutional structure and reform and ways of incorporating human values and environmental considerations into decision-making processes. These issues are commonly neglected (Imperial, 1999). In this chapter, the aim is to develop insight in how institutions operate, followed by a framework for analysis of institutions dealing with environmental management.

Against this background, this chapter will deal with the following issues.

Section 4.1. Models of environmental management
Here I will describe different models of institutions dealing with environmental management, and the recent changes that occurred. Emphasis is given to the model of ‘strategic environmental management’, with linkages to good governance, decentralisation and organisational arrangements. The concept of environmental governance is introduced.

Section 4.2. Institutional structures
For putting into practice environmental management and governance, this section reviews the required functions to be performed by environmental institutions, the instruments that can be used and the organisational arrangements at different functional levels.

Section 4.3. The decision-making process
Here attention is given to the environmental management process and governance issues by which the institutional structures operate. The subject of decision-making is reviewed in order to understand how institutions operate, interact, design policies, and take decisions. This leads to criteria for the environmental management process, including both rational and adaptive components of decision making.

Section 4.4. A framework for institutional analysis
Based on the previous sections, a framework is developed to analyse the institutions dealing with environmental management. The framework allows assessment of the quality of the environmental management process and the institutional structure. It can be used to set strategic priorities for improved environmental management and governance and ‘translate’ these into plans for institutional reform.

Section 4.5. Conclusions
4.1 MODELS OF ENVIRONMENTAL MANAGEMENT

4.1.1 DEFINITIONS

An institution may be defined as “an enduring regularity of human actions structured by rules, norms, or shared strategies” (Imperial, 1999). This refers to institutions as the ‘the rules of the game’, both formal and informal. Secondly, institutions are the organisations (groups of individuals bound by common objectives) to implement the strategies and respect the rules. How organisations operate is determined by the institutional structure, of which the organisational arrangements are one important element. In this chapter I will focus at the second component, i.e. the way organisations responsible for environmental management are organised and how they operate (the process), or should operate. Therefore, in most cases the term institutions can be exchanged for organisations.

Following Miller et al. (1999), in this book the terms environmental ‘management’, ‘decision-making’ or ‘policy-making’ all refer to the process of facilitating, designing, implementing and evaluating policies, strategies and actions to manage the diversity of environmental functions. I will use the following comprehensive definition of environmental management: “the process in which (formal and informal, public and private) organisations apply instruments to develop and implement a set of priority actions on the basis of societal preferences and goals for: the maintenance or improvement of environmental quality, the provision of environmentally derived or related services and/or the conservation, maintenance and enhancement of natural resources and ecosystems” (based on Lovei and Weiss, 1998).

4.1.2 ENVIRONMENTAL MANAGEMENT MODELS

A paradigm shift in the field of environmental management

In the field of environmental management and decision-making we are in the midst of ‘a quiet revolution’ (Sexton et al., 1999) or ‘a paradigm shift’ (Imperial, 1999). Themes being addressed by new concepts of environmental management are:

- Approaching environmental issues from an integrated or systems perspective, with the implication of treating environment as a cross-sectoral theme, not one sector
- Integrating government, business and community in environmental decision-making processes, improving co-ordination and broad public participation
- Improving institutional performance, by incorporating issues of governance, equity and justice, hence not only efficiency and effectiveness.

There are a number of reasons explaining these changes. First, the complexity and interconnectedness of natural systems and the interdependencies of environmental quality and human society has only recently reached the political agendas. While early environmental problems were relatively simple in terms of scientific and technical understanding (e.g. effects of sewage discharge on local water quality) and decision making structure (e.g. effects of CFCs on ozone levels), many current problems are characterised by complex decision making structures due to their intricate linkages with poverty, national economy, security, etc.. Secondly, it becomes increasingly clear that environmental policies should address root causes of environmental problems, found in institutional settings, human belief.

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1 Rules specify both rights and duties (Orstom, 1990). Rights refer to particular actions that are authorised. A right is a claim to a benefit stream. Rights define the uses which are legitimately viewed as exclusive. For every right that exists, rules define specifically what acts are required, permitted and forbidden in exercising the authority provided by the right.
systems, socio-economic and cultural values (e.g. on consumption, nature perceptions, security). Thirdly, the sustainable development concept underlines the equity aspects of environmental policy making, acknowledging that poor people in every part of the world are first of all exposed to the negative impacts of environmental degradation.

**Three models of environmental management by public institutions**

Informal and traditional institutions (regulations, norms and organisations) with respect to natural resources management existed long before formal public institutions were established. Some of these have been formalised, others have remained informal and may or may not be recognised or legitimised by government; many have been replaced by state regulations. As a reference, one might distinguish three stages of formal environmental management by public institutions, from ‘conventional’ to ‘transitional’ to ‘modern’ or ‘strategic’ (based on Jänicke and Weidner, 1997 and Russell and Powell, 1996) (Box 4.1). The changing role of government can be characterised as shifting from regulation and implementation, towards creating an enabling context for others to act.

**Box 4.1: Characteristics of three models of environmental management: (1) conventional, (2) transitional and (3) strategic (based on Russell and Powell, 1996, and Jänicke and Weidner, 1997)**

**Environmental management public institutions**
1. Environmental management responsibilities dispersed over sectoral agencies
2. Environmental institutions at different levels but without sufficient co-ordination
3. Central unit for integrated environmental planning with units in sectoral agencies and decentralised institutions for implementation.

**Environmental pollution control instruments**
1. Focus on technology specifications and banning certain products and activities
2. Move towards technology-based permits (best available technology) and discharge standards
3. Tradable discharge permits and strategic use of public information

**Environmental impact assessments**
1. Environmental impact assessment (EIA) for public projects limited to mitigation of impacts
2. EIAs for public and private projects in which alternatives are required and the objective is to raise quality
3. Strategic EIAs to integrate environmental issues into strategic planning and address cumulative effects

**Civil society (non-governmental and people’s organisations – NGO’s and PO’s)**
1. Weak or non-professional environmental NGOs
2. Strong and competent NGOs playing a consultative role in political decisions
3. NGOs playing a consultative role in industry; development of co-management initiatives

**Private sector**
1. Environmental interests are poorly articulated within the economic system
2. Environmental interests limited to particular interested groups (e.g. clean technology)
3. Environmental interests are articulated by a broader group of ‘green’ business organisations
Strategic environmental management may be considered as a more pro-active approach that incorporates environmental protection and management issues into long-term economic and other sectoral policies. While the overall goal of environmental management is to protect or improve environmental conditions, specific objectives can be formulated as follows:

1. To reduce negative (or enhance positive) environmental externalities
2. To provide environmentally related public goods and protect locally managed common properties
3. To improve sectoral or spatial natural resource allocation to control environmental degradation
4. To allocate natural goods and services across time for successive generations.

4.1.3 TOWARDS ENVIRONMENTAL GOVERNANCE

There now appears to be an increased interest by public institutions in many developing countries to develop a strategic approach to environmental management. At the basis of this interest are at least three important developments (Kessler et al., 2001).

1. The development model of ‘good governance’ emphasises the role of competitive markets, government responsibility to manage collective goods and common property resources, and the importance of civil society. Values of pluralism, accountability and transparency must also be integrated into the area of environmental management. Specific topics are economic incentives, citizen participation and new organisational arrangements with a new role of the state in collaboration with the private sector and civil society.
2. Capacities need to be strengthened to address the environmental risks of private sector growth and free trade. In many developing countries, traditional comparative advantages lie mainly in natural-resource extraction activities. As a result, economic reform and free trade lead to an increase in exports based on natural resources. Strong, flexible and effective environmental management needs to be in place to mitigate the risks of such expansion.
3. There is need for environmental management to build bridges between public and private sector services. Businesses have come to view the environment as an opportunity to add value to investment, gain competitive advantage, achieve higher margins through eco-efficiency, maintain and increase sales through positive images, and make more efficient use of assets. There are potential benefits for public-private partnerships in environmental management, such as improving access to capital and technology for eco-efficient enterprises.

This leads to the concept of environmental governance, which may be defined as “the exercise of economic, political and administrative authority to manage a country’s environmental affairs at all levels. It comprises the instruments, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. It includes the state, but transcends it by taking in the private sector and civil society” (adapted from Commission on Global Governance, 1994). Environmental governance can be considered as the ‘fundamental parameter’ for environmental management, including aspects of good governance such as social justice (equitability) and democracy of decision making (see also section 4.2.2).

To develop an environmental governance model, I will now discuss three important challenges to be addressed: finding leverage in contextual changes, environmental mainstreaming, organisational learning and developing polycentric organisational arrangements.
Box 4.2: Contextual conditions influencing environmental management (Jänicke and Weidner, 1997)

Cognitive-informational conditions
- Level of environmental knowledge and public awareness
- Access to information sources, existence of effective information and communication channels
- Level of education (in general) and level of environmental education (specific)
- Attitudes towards environmental protection and conservation, perceptions of nature
- Willingness to pay for better environmental management

Political-institutional conditions
- Level of participation and shared decision making, transparency of decision-making
- Level of decentralisation, transparency of communication and information flow between levels
- Existence of (environmental) pressure groups, and their role in decision making
- Existence of partnerships and collaboration between communities, private sector and Government
- Level of integration and collaboration between sectoral policies
- Financial and human resources available for environmental management
- Existence of well-defined and accepted environmental standards and procedures

Socio-economic conditions
- Level of income, social services, education, security, level of consumption
- Dependency of economy on natural resources, type of economy
- Relations between environmental qualities and socio-economic stress (e.g. poverty, conflicts)

Technological conditions
- Efficiency of existing technology
- Availability and use of innovative technology
- Research and policies to stimulate technological innovation and spread of technologies

Finding leverage in contextual changes
Jänicke and Weidner (1997) distinguish four sets of contextual conditions that determine which environmental management model is most applicable: cognitive-informational, political-institutional, socio-economic and technological conditions (Box 4.2). Insight in these contextual factors helps to understand an institution as it is, while on the other hand it helps identify points of leverage to induce desirable change in each of these four domains. The latter refers to the need for institutions to be responsive to contextual dynamics.

Mainstreaming environmental concerns
Typically, in the conventional model of environmental management the environment is treated as a sector rather than a cross-sectoral theme. A ‘strategic’ stage of environmental management requires integration of environmental sustainability concerns as a criterion and objective into decision-making processes and activities of public institutions (commonly known as ‘mainstreaming’). In developing countries this implies building upon the positive linkages between poverty reduction and economic growth and environmental protection (WorldBank, 1996). Some of the institutional reasons why mainstreaming the environment proves to be difficult are the following (based on WorldBank, 2001):
- The sectoral organisation of institutions and subordinate position of environmental sector
• Conflicting policies, leading to poor implementation of environmental objectives or policies as these are not worked out at management and operational levels (even environmental concerns well formulated in sectoral strategies are not necessarily reflected in subsequent projects)

• Absence of a monitoring framework to evaluate whether environmental policies are implemented

• Lack of incentives to adhere to environmental policies, as well lack of capacities to do so.

Organisational learning
To adequately manage the environment, the variability and resilience of ecosystems should be mirrored within the management institutions. Key attributes for adaptive management systems are organisational (double-loop) learning and responsiveness to environmental changes and societal demands through monitoring and early warning systems (see section 2.5.2). The aim is not survival of the management institution under different conditions, but adaptation of institutions to appropriately address environmental and societal dynamics and demands. This is an important component of environmental governance that should trickle down to all lower management levels.

According to Weick and Westley (1999) organisational learning is an oxymoron, because organisations normally aim to ‘get organised’ (forget and reduce variety), while learning requires variety and openness to surprise). Organisational learning would be associated with exploitation and exploration, with both the establishment of routines and accepting disruptive, non-routine behaviour in the interests of adaptation. The challenge of organisational learning is of finding the optimal juxtaposition between the two, basically between order and disorder. Too much of either would result in destruction of the system. One element of supporting this would be to have flexible polycentric organisational arrangements.

Developing polycentric organisational arrangements
Centralised forms of government have been criticised for being rigid and not resilient, apparently in contradiction with many ‘traditional’ and local level management institutions. Nowadays decentralisation and devolution of environmental management functions is considered an important component of good governance (Binswanger et al., 1994). The responsibility for environmental issues is usually one of the first to be transferred to more or less autonomous local authorities. This can be considered a positive change, as local stakeholders grow better organised, assertive and aware of their interests. But decentralisation also offers opportunities to local decision-makers to get their share in

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2 Typically, at policy level environmental issues are fully taken into account, at management level strategies incorporate environmental concerns to some extent, but at operational level other priorities predominate.

3 Some of the reasons why centralised forms of government have been criticised include: standard responses to diverse demands, high costs for beneficiaries, mismatch between supply and local demand, failure to manage public goods, and inefficiency (based on Imperial, 1999).

4 For instance according to Zerner (1999), community institutions should be understood as dynamic social interventions, shaped by local experience and influenced by external factors.

5 Decentralisation (in an administrative sense) can be defined as the transfer of responsibility (for planning, managing, taxing and spending) from the central government to other groups within society. Three types of decentralisation may be distinguished: deconcentration (functions redistributed among different government levels), delegation (functions transferred to organisations not fully controlled by government but ultimately accountable to it), and devolution (functions fully transferred to relatively autonomous realms of authority with a primary responsibility to their constituencies) (Lutz and Caldecott, 1996). Decentralisation (in its two first types) is often distinguished from devolution.
the fruits of resource exploitation (often by unsustainable practices). Ribot (2002) on the basis of case studies on decentralised environmental management concludes that for decentralisation to deliver on its promises local governments have to be truly democratic and have to have real power over major decisions. Also, there is much time needed for capacity building of local governments.

Experiences show that decentralisation is not a panacea for environmental management. Local decision-makers may not be sufficiently accountable or concerned with regional, national or global environmental priorities or limitations, while local communities do not know their rights or have no tradition of holding those in power accountable. A bioregion may become more vulnerable to external forces if no longer sheltered by a national government (Lutz and Caldecott, 1996). Property rights do not constitute the necessary and sufficient conditions to motivate local actors to execute effective environmental management (Zerner, 1999). Other elements include economic incentives and local power struggles. The combination of declining social and protection services, increasing inequality and local poverty, and improved conditions for ‘free trade’ of products based on destructive resource exploitation (see case study Annex I.3.4), are a commonly encountered mix of factors that make decentralisation particularly risky in terms of environmental management.

To overcome these problems, attention has been given to legal aspects, fiscal aspects, incentive structures, benefit sharing, enabling policies and capacity building (Lutz and Caldecott, 1996). One critical aspect is that of developing polycentric organisational arrangements for environmental management. These are multiple centres of shared or overlapping authority (Imperial, 1999), including multi-stakeholder forums and agencies at different levels. To manage the complex relations between human society and the environment, polycentric organisational arrangements would meet the need for more resilient institutions, as the multiple actors and relations involved are more flexible than hierarchical systems. But polycentric arrangements can only work where there is real devolution of management responsibilities, with the role of the state changing from being directive and controlling to being facilitating, with enforcement as a crucial but last resort. Polycentric arrangements, based upon principles of mutual trust and transparent communication, are an important building block for collaborative management arrangements (see Chapter 5).
4.2 INSTITUTIONAL STRUCTURES

This section reviews the functions to be performed by environmental institutions, the available instruments and the organisational arrangements. Together, this will be referred to as the institutional structure for environmental management. Environmental management as a decision-making process will be discussed in section 4.3.

4.2.1 FUNCTIONS AND INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT

Environmental management functions
To realise set objectives, institutions should perform different functions (tasks, responsibilities). These functions might be performed by one institution, or shared (e.g. in co-management arrangements – see Chapter 5.4). A possible classification of governance functions is the following:

- Normative and controlling functions, e.g. by setting norms and goals, defining a vision and a strategy of desirable change, applying control instruments
- Steering and influencing functions, e.g. by putting instruments in place, attributing responsibilities (and where necessary taking own responsibilities) for implementation
- Enabling and facilitating functions, e.g. by creating markets, opening up communication channels, making available information and financial resources
- Ensuring organisational learning functions, e.g. by monitoring, feedback, learning instruments and integration of lessons learned

Based on this overview, Table 4.1 gives specific environmental governance and management functions.

Table 4.1: A classification of environmental governance and management functions (Kessler et al., 2001, based on IDB, 1999)

<table>
<thead>
<tr>
<th>Functions</th>
<th>Specifications for environmental management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitating</td>
<td>• Environmental capacity building, training</td>
</tr>
<tr>
<td></td>
<td>• Provision of human resources, funds and other resources</td>
</tr>
<tr>
<td></td>
<td>• Infrastructure development</td>
</tr>
<tr>
<td>Defining policy goals and norms</td>
<td>• Defining goals, strategic priorities and appropriate instruments</td>
</tr>
<tr>
<td></td>
<td>• Spatial / territorial planning</td>
</tr>
<tr>
<td></td>
<td>• Setting environmental norms and standards</td>
</tr>
<tr>
<td></td>
<td>• Developing environmental legislation</td>
</tr>
<tr>
<td>Implementation of policies and</td>
<td>• Control and enforcement</td>
</tr>
<tr>
<td>instruments</td>
<td>• Implementation and coordination of activities and effective instruments</td>
</tr>
<tr>
<td></td>
<td>• Disaster preparedness</td>
</tr>
<tr>
<td></td>
<td>• Education, awareness raising, creating partnerships</td>
</tr>
<tr>
<td>Monitoring and learning</td>
<td>• Monitoring and early warning</td>
</tr>
<tr>
<td></td>
<td>• Research and establishment of data banks</td>
</tr>
<tr>
<td></td>
<td>• Learning instruments, internal and external communication</td>
</tr>
<tr>
<td></td>
<td>• Knowledge management</td>
</tr>
<tr>
<td>Developing an enabling context</td>
<td>• Ensuring participation</td>
</tr>
<tr>
<td></td>
<td>• Ensuring access to information, communication channels, lobby work</td>
</tr>
<tr>
<td></td>
<td>• Ensuring co-ordination and inter-sectoral policy coherence</td>
</tr>
</tbody>
</table>
Instruments for environmental management

A set of instruments is available for institutions to perform the above functions in a cost-effective way (Table 4.2). The first set of instruments that was developed to perform environmental management functions has been that of setting standards, rules and regulations and enforcement (‘command and control’). This approach appeared to be insufficiently effective (Sexton et al., 1999). In industrialised countries the market-based instruments have complemented ‘command and control’ instruments, with good potentials to reduce pollution levels and adopt eco-efficient technologies. There are options for companies to produce ‘ecological products’ and develop a ‘green image’ for which enlightened consumers are willing to pay more following awareness raising campaigns.

For less-developed countries regulatory and market-based instruments tend be less effective because of state failure to control environmental standards, market failure to give price signals (Véron, 2001), the lack of credible regulations or control institutions, and inappropriate sanctions (World Bank, 1997). In addition, consumers or polluters have less capacity to pay or make additional investments, and many environmental problems are the result of over-exploitation for which there are no cost-effective alternatives. Therefore, the ‘communicative’ (community-based or participatory) approach is believed to be more effective as people depend more directly on their physical environment and have a genuine interest in protecting it (Ghai and Vivian, 1992). By now industrialised countries also become aware of the limitations of market-based approaches, and commonly adopt participatory approaches, such as interactive planning and co-management (see Chapter 4.4).

The choice of instruments is context-specific and will depend on such factors as the existing constitutional provisions, social and economic development, environmental problem areas, private sector involvement, and public preferences. Each of the four types of instruments has its merits and limitations. What may work best is a hybrid approach, whereby for each environmental problem a mixture of instruments from these four categories is developed, in such a way that these reinforce each other and create synergy. The use of instruments in a hybrid approach can be sequential or parallel, and obviously requires good co-ordination, fine-tuning and monitoring.

Table 4.2: A classification of environmental management instruments (Kessler et al., 2001, based on World Bank, 1997)

<table>
<thead>
<tr>
<th>Category of instrument</th>
<th>Common types of instruments</th>
<th>Innovative types of instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental regulations (‘command and control’)</td>
<td>Standards, regulations, zoning, conservation areas, bans, quotas, permits, benchmarking</td>
<td>Buffer zoning, bio-regional approach, eco-efficiency standards</td>
</tr>
<tr>
<td>Making use of existing markets</td>
<td>Targeted subsidies, subsidy removal, levies and tax exemptions, user fees, charges</td>
<td>Differential land-use taxes, ‘polluter and beneficiary’ pays taxes, tourism charges, international transfer payments</td>
</tr>
<tr>
<td>Creating markets</td>
<td>Property rights, tradable permits, tradable credits, land titling, resource ownership</td>
<td>Protection rights, product certification, carbon offset trading, bioprospecting deals, fair trade, tradable development rights, intellectual property rights</td>
</tr>
<tr>
<td>Engaging the public (‘social approach’ / ‘communicative’)</td>
<td>Public participation, information disclosure, communication, awareness raising, education, training</td>
<td>Co-management, covenants, agreements between government and private sector, partnerships, joint fact finding, participatory monitoring, private enforcement</td>
</tr>
</tbody>
</table>
4.2.2 ORGANISATIONAL ARRANGEMENTS

**Functional levels**

Organisational arrangements are required to perform the functions and implement the instruments for environmental governance and management. Three levels of institutional functions may be distinguished, with associated organisational arrangements and rules, nested in each other, i.e. the higher level rules determine the lower level set of rules (based on Orstom, 1990; Lord and Israel, 1996; Hofwegen and Jaspers, 1999).

1. *The constitutional functions.* These include decisions on societal goals (e.g. sustainability, governance, equity) and principles (e.g. participation, polluter-pays, precautionary principle) and the associated normative and executive legislation and policy framework. At this level rules are set that describe how rules at the next level may be created, enforced or modified (how, by whom, etc.). It should provide the suitable conditions for the next institutional level to operate.

2. *The organisational management functions.* These include strategic planning, policy development and organisational management to allow the operational level to function properly. It refers to actions taken by organisations (collective action), and the rules, instruments, frameworks etc. that describe how operations should be carried out.

3. *The operational functions.* These include decisions about when, where and how to do something, i.e. the day-to-day resource management by individuals or groups (e.g. with respect to resource assessments, operational planning, implementation, law enforcement, involving stakeholders).

The boundaries between these three levels are not sharp. Also, functional levels should not be confused with administrative levels: one administrative level can have agencies and organisational arrangements responsible for different functional levels, and vice versa (e.g. constitutional functions occur at local, regional, national and international levels).

The functions for environmental governance and management (Table 4.1) can be attributed to these three institutional levels. Table 4.3 gives an example for the water sector.

**Table 4.3: Environmental governance and management functions for the water sector at three institutional levels (Hofwegen and Jaspers, 1999)**

<table>
<thead>
<tr>
<th>Constitutional level (governance)</th>
<th>Organisational level (government, management)</th>
<th>Operational level (actions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enables effective development and implementation of laws</td>
<td>Ensures that user interests are reflected in decisions</td>
<td>Provides effective services to users</td>
</tr>
<tr>
<td>Enables institutional development</td>
<td>Provides clear rules for decision-making</td>
<td>Represents users in decision making</td>
</tr>
<tr>
<td>Sets criteria for participation</td>
<td>Provides reliable information</td>
<td>Ensures cost recovery</td>
</tr>
<tr>
<td>Sets standards for resource use</td>
<td>Provides a framework for analysis and planning</td>
<td>Negotiates between users and managing agency</td>
</tr>
<tr>
<td>Enables effective policing</td>
<td>Provides power to sanction violations</td>
<td>Monitors demands and service quality</td>
</tr>
<tr>
<td>Provides tools and instruments</td>
<td></td>
<td>Has power to sanction violations</td>
</tr>
<tr>
<td>Ensures transparency and accountability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensures human and material resources</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Environmental governance and environmental justice

While the organisational functions can be associated with government and environmental management, the constitutional level of environmental management corresponds to what is generally referred to as the governance level. Environmental governance comprises both the organisations of the public, private and civil society sectors and their arrangements of collaboration, and the normative principles that should guide these. Environmental governance can be considered as the ‘fundamental parameter’ for environmental management, including aspects of good governance such as social justice (equitability) and democracy of decision making.

Others also distinguish ‘environmental justice’, which focuses on democracy, equitable dispersion of power, and social justice goals. It refers to the right to a safe, health, productive and sustainable environment for all, and the conditions in which such a right can be freely exercised, through self actualisation and personal and community empowerment (Mitchell, 2002). In comparison, environmental governance focuses on the effective management of environments and the institutional, political and economic means and processes through which this may be achieved (Zerner, 1999).

Organisational arrangements

Now we turn to the organisations involved, and their relationships (networks, coalitions, partnerships). Since environmental management is an intersectoral activity, the arrangements include multiple linkages with different organisations and sectors. The organisations involved can be subdivided into three categories: the public sector, the private sector and the ‘middle ground’: civil society (Table 4.4). These categories are not strictly exclusive and separated from each other; various ‘blends’ may exist.

<table>
<thead>
<tr>
<th>Societal organisation</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Public sector</strong></td>
<td>• Supra-national</td>
</tr>
<tr>
<td></td>
<td>• National</td>
</tr>
<tr>
<td></td>
<td>• Subnational by sector</td>
</tr>
<tr>
<td></td>
<td>• Subnational by territories</td>
</tr>
<tr>
<td><strong>2. Civil society</strong></td>
<td>• Non-governmental organisations (NGO’s )</td>
</tr>
<tr>
<td></td>
<td>• Indigenous communities and people’s organisations (POs)</td>
</tr>
<tr>
<td></td>
<td>• Environmental organisations and other PO’s (e.g. farmers, labourers)</td>
</tr>
<tr>
<td></td>
<td>• Mass media</td>
</tr>
<tr>
<td><strong>3 Private sector</strong></td>
<td>• Multinational enterprises</td>
</tr>
<tr>
<td></td>
<td>• National enterprises</td>
</tr>
<tr>
<td></td>
<td>• Small and medium-sized (local) enterprises</td>
</tr>
</tbody>
</table>
Now we can turn to the question of which organisations should perform which functions. This will have consequences for human resources, financial resources, technical capacities, legal setting, organisational structure and management aspects.

First of all, both the environmental management model and the organisational structure will strongly depend upon the existing political, institutional and cultural context (Box 4.2). In other words, it will not be an optimal reflection of the requirements for environmental management. Secondly, as environmental management develops towards environmental governance, the instruments and functions become more diverse and the organisational arrangements also increase in complexity. For instance, governance based on self-regulation and self-steering at local levels requires higher intensities of co-ordination and collaboration than governance mainly based on law enforcement.

Therefore, it will be difficult to propose an ‘ideal’ organisational arrangement. As an example based on a study for Latin American countries, environmental management functions might be allocated as indicated in Table 4.5. The functions attributed to the public sector could be further specified (national, decentralised, sectoral, territorial). Decentralisation implies an increasing role of local governments and local actors, with sharing of responsibilities through collaborative management. The allocation of functions as indicated in Table 4.5 only indicates where the prime responsibility for a certain function is located.

Table 4.5: Possible allocation of environmental governance and management functions to categories of societal organisation (based on a study on Latin American countries, Kessler et al., 2001).

<table>
<thead>
<tr>
<th>Public sector</th>
<th>Civil society</th>
<th>Private sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Legislation and justice on international / national issues</td>
<td>- Advocacy (international) and (political) lobbying; getting issues on the political agenda</td>
<td>- Research and development of environmentally sound technologies</td>
</tr>
<tr>
<td>- Co-ordination and policy coherence (international, national and inter-sectoral)</td>
<td>- Awareness raising and education (watchdog function)</td>
<td>- Technical implementation of environmental regulations and activities</td>
</tr>
<tr>
<td>- Disaster preparedness</td>
<td>- Co-ordination and networking (international, national inter-sectoral)</td>
<td>- Provision of environmental expertise (e.g. control)</td>
</tr>
<tr>
<td>- Legislative framework, regulations and quality standards</td>
<td>- Fund raising and management for environmental objectives</td>
<td>- Co-management and co-decision making (covenants and codes)</td>
</tr>
<tr>
<td>- Control and enforcement</td>
<td>- Implementation of (innovative) environmental activities</td>
<td>- Monitoring and environmental auditing</td>
</tr>
<tr>
<td>- Economic and market instruments</td>
<td>- Research and provision of environmental expertise</td>
<td></td>
</tr>
<tr>
<td>- Finance for environmental programs and investments to support private sector</td>
<td>- Co-management (with public or private sector) and co-decision making (e.g. in norm setting and legislation)</td>
<td></td>
</tr>
<tr>
<td>- Strategic planning, mainly at sectoral and national levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Spatial planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Information supply (public disclosure), environmental education and research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Capacity development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Environmental infrastructure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3 THE DECISION MAKING PROCESS

Attention is now given to aspects of governance and decision-making, to understand how institutions operate, interact, design policies, and take decisions. This leads to conclusions with respect to characteristics and criteria for the environmental management process, including both rational and adaptive components.

4.3.1 RATIONAL PLANNING THEORY

Environmental management can be considered a decision-making process. It is commonly seen as a goal-oriented process that can be rationally divided into four phases (Box 4.3).

The four phases can be considered as elements of an iterative and continuous process. Normally, it is implemented as a forward process from problem identification to implementation; alternatively it can be used as a backward process to evaluate results. Weaknesses in one phase can often be traced back to weaknesses in other (earlier) phases (e.g. weak enforcement due to poor problem definition). In practice, organisations may work simultaneously on different phases for different environmental problems, as each problem follows its own dynamics within a political and societal context.

Box 4.3: Four phases of the environmental management process according to rational planning theory (adapted from Lovei and Weiss, 1998 and Winsemius, 1986)

1. Recognition and definition of environmental problems and potentials
Environmental problems are identified, analysed and defined according to the views and perceptions of the various stakeholders. The aim is to reach political recognition of the environmental problems. This can be achieved by providing information, political pressure, and solution strategies, and demonstrating how environmental potentials can serve societal development goals and relate to other sectoral policies. Priorities must be set and interrelations demonstrated.

2. Formulation of environmental policies for achieving environmental goals
Policies are defined to solve priority environmental problems. These include short-term measures to solve urgent problems and measures that provide long-term structural solutions. Policies will be based on a long-term vision and strategy on environmental management within a changing society. The definition of norms and standards is part of this phase. During formulation of concrete measures conflicts often arise between proponents and opponents; the focus is on win-win options and strategic partnerships between different interest groups.

3. Implementation and enforcement of environmental policies
The organisations involved are enabled to implement the policies through supportive means and capacities. This phase generally receives less political attention as the major political debates have been concluded.

4. Monitoring of environmental policies
The implementation of environmental policies must generate the expected results: solving priority problems and improving environmental quality. Adjustments are made to improve efficiency of implementation. Monitoring is essential for providing feedback to the policy levels and generate insight into the relevance, effectiveness and efficiency of the environmental management arrangements.
Figure 4.1 shows how the environmental management process is related to the institutional structure as discussed in section 4.2, and how these are situated in the context of governance and societal dynamics. A good environmental management process should lead to improvements of environmental qualities in line with societal preferences, and take advantage of positive societal dynamics (e.g. increased awareness after a calamity). A focus on the process allows greater flexibility and quicker results than concentrating on organisational arrangements, which tend to be rigid and removed from the human–environment dynamics. This focus also helps develop environmental governance.

4.3.2 LIMITS TO RATIONAL MODELS

Much of the work in environmental planning, assessment, management and policy making is based on the implicit assumption that the provision of good information will contribute to better environmental management decisions. This approach corresponds to the classical approach to decision-making, whereby objectives are defined, decisions taken and policies defined on the basis of a linear approach such as outlined in the previous section, using the best available information and data. This is usually referred to as the rational, objective and knowledge-based perspective of decision making.

However, most empirical evidence shows that decision-making processes in practice do not follow rational choices, even in cases where efforts are made to improve rationality (Kornov and Thissen, 2000). While the elaboration of strategic options and alternatives might make use of rational principles and models to analyse and structure reality, this is only a tool to support decision making. The usefulness of such tools depends upon its relevance for decision making.
So are there models of real-life decision making? Simon (1957) introduced the concept of ‘bounded rationality’ which captures the idea that human decisions are bounded by limited mental and information-processing capacities. Whereas decision-makers may intend to be rational, their behaviour can better be described as reasoned (but not irrational). The net outcome is likely to be a ‘satisficing’ rather than an optimising decision: one which satisfies and suffices in the given circumstances, for the time being (Miller et al., 1999). Whereas in relatively familiar situations decision-makers may follow a ‘logic of consequence’, and with good results, in more complex situations they will adopt heuristics (rules of thumb) to arrive at a satisficing outcome. Decision-making is then based on principles such as habits, rules, doing similar things as other people, repeating what worked in the past, or imitating successful people (Dawes, 1988). More fundamentally, these decisions are based on belief systems, development paradigms, development narratives, political models, cultural traditions, etc.

Post-modern theories assert that it is impossible to separate objective knowledge from subjective value judgements. In the socio-constructivist approach to policy and decision-making the truth is seen as a construct created by social interactions. ‘Post-normal science’ emphasises the need to generate knowledge as part of a participatory process, whereby both facts and values, and their mutual influences, are made explicit (Funtowicz and Ravetz, 1992). This becomes more necessary as problems become more complex and science meets more uncertainties. It refers to the need for democratic control over information and scientific research.

In ‘t Veld (2000) elaborates on the question how knowledge and values interact, and concludes that values influence knowledge production more than the other way round. Knowledge is often requested, generated and interpreted in order to reinforce or support pre-defined assumptions and paradigms. While in the decision-making arena policy values play a role, in the knowledge arena epistemological values play role. It becomes increasingly clear that these cannot be isolated from each other.

This leads to a number of conclusions that are relevant to the subject of this book:

- Applied knowledge production should take place on the basis of the different paradigms that exist in the decision-making arena (from different stakeholders), and not only the predominant one
- There should be an open debate with a broad range of actors involved on the assumptions and belief systems based upon which applied knowledge is produced
- There should be much attention for the process of knowledge production, with accountability and transparency of decisions being taken as leading concepts.

4.3.3 DECISION-MAKING BY MULTIPLE ACTORS

Whereas the previous considerations result from human and organisational limitations, other considerations come forward from a wider perspective of multiple-actor policy making. It is often implicitly assumed that decisions are taken by one person or party, such as a government agency, and at a distinct point in time, assuming clarity of objectives and full information availability. This view links up with the rational decision making model. However, decision-making always involves multiple actors, and is often characterised by a high level of confusion and complexity (Kornov and

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6 From chaos theory comes the concept of attractors (Geldof, 2002). These can be interpreted as paradigms which appear to be attractive and repetitive, even if not in line with the logic of consequence (e.g. continuing to use the car when it does not save time).
This is also true for environmental management. Initial identification of an environmental problem takes place by stakeholders and experts (Dunn, 1994). The next step is the recognition of the problem as a public problem (e.g. through events, information disclosure, media coverage). Once it has become a public problem it may be placed on the political agenda (e.g. through political action, public pressure). After that it becomes part of wider policy concerns, and may trigger policy reform. The actors in each of these phases vary, as shown below.

The rational knowledge-based model does not dwell on the question of whose knowledge prevails, when choices are made, where and how knowledge is generated and to what ends, and how it is made accessible. This refers to the fact that decision-making can also be seen as a power game whereby interest groups compete for the control of scarce resources (Miller et al., 1999). Power-holders manipulate information, withhold it, ignore some, and apply tools or methods that justify their favoured decisions. Decision making models describing these processes include terms such as ‘policy soups’, ‘muddling along’ and ‘policy arenas’. These refer to the mix of problems, solutions, information, etc. out of which decisions emerge in an unpredictable way.

What does this give us in terms of practical tools or models? One interesting model describing these dynamics is that which characterises policy- and decision making as a stream model (Kingdon, 1984). He wondered why some subjects become prominent on the policy agenda and others do not, and why some alternatives are seriously considered and others not. To understand decision-making he considered three process streams: streams of problems, policies (solutions) and politics (objectives, political will). These streams are largely independent from each other, but where they join decisions can be taken. These junctures are called ‘policy windows’. Such matching is not always successful and problems may disappear from the political agenda without having encountered a solution. The matching process is not ‘random’, but includes a certain amount of coincidence. The periods during which problems are placed on the public or political agenda can vary greatly. The advocacy of solutions may precede the appearance of compelling problems or of events on the political agenda. The moments of ‘policy windows’ are often brief.

The analytical advantage of the stream model is in its focus on the social and political dynamics as a basis for policy-making, its consideration of actors outside the process and its acceptance of coincidence. The stream model pays attention to ‘getting subjects on the public and political agenda’ and ‘opening policy windows’. This brings us to the insight that, apart from a rational approach from problem definition to finding solutions, strategies, etc. (Box 4.4), environmental management should stimulate the creation of a ‘stream of solutions’, or at a higher functional level create an enabling context for society to create their own solutions. The institutions involved should be capable and flexible to rapidly benefit from ‘policy windows’ when these appear.
4.3.4 THE EXPECTED RESULTS OF THE DECISION MAKING PROCESS

It fits into the rational planning model to suppose a linear management cycle, from analysis to planning, implementation (action) and monitoring. A strategic plan would in that case be a deliberate, purposeful and planned moment within this cycle. Then, based on a strategic plan more detailed plans would be made before coming to concrete actions. Mintzberg and Waters (1985), however, define a strategy as ‘a pattern in a stream of actions’, and speak of ‘emerging strategies’ in parallel with concrete actions. This refers to the other way of looking at decision making, being part of an adaptive process responding to political and societal dynamics and concrete actions and including coincidence.

While one generally expects concrete results from decision-making processes, others emphasise the influence of decision-making processes on people’s motivations and perceptions (mind-sets), as well as awareness building, networking, increased insights, mutual understanding, improved collaboration, empowerment, etc.. These considerations refer to the ‘soft side’ of decision-making, which opens up a new array of concepts and approaches with which linkages could be forged, for instance with interactive management and organisational learning. Strategic plans or decisions can then be considered as moments of consolidation at a distinct moment during a learning process.

This links up with the fact that most institutional change is path dependent and incremental rather than totally reconstructive or destructive (Imperial, 1999; Miller et al., 1999). Institutional change often involves a series of small steps with low initial costs and early successes. A well designed strategy may provide the long-term direction for such change to take place.

4.3.5 IMPLICATIONS FOR ENVIRONMENTAL GOVERNANCE

It appears that we can distinguish two perspectives of decision making: one is the rational, objective and knowledge-based perspective, the other is the adaptive, intuitive, unplanned perspective (Table 4.6). Environmental governance should take into consideration both perspectives. As (environmental) problems become more complex, there is need for a structure and coherent instruments and procedures to support the decision-making process (Hofwegen and Jaspers, 1999). The rational perspective should provide such a structure, allowing one to identify priority issues within the complex field of environmental –society interactions, acquire a holistic (long-term and large-scale) overview and set strategic priorities other than those aimed at short-term results. The adaptive perspective refers to the need to rapidly respond to new problems and opportunities within the set strategic framework. This is important for environmental governance because ecosystems are complex systems which require resilient institutions to respond to unpredictable dynamics.

The importance attributed to these two perspectives has consequences for the institutional functions at different levels (section 4.2.2). To be able to implement an adaptive approach at operational level, there is need for a certain level of flexibility at all levels, including rules and organisational arrangements (not to be mistaken by flexibility in law enforcement). In general, polycentric organisational arrangements and networks with social groups and different institutional levels would be suitable to support this, and could benefit from experiences about learning or negotiation processes, involving multiple stakeholders to avoid manipulation by powerful actors or groups. Specific for the environmental sector is the need for strong connections with social groups with an environmental focus (environmental NGOs, those representing victims of environmental degradation, indigenous communities, etc.). These should include social groups that represent absent stakeholders (see section 2.4.2).
The adaptive perspective can be further characterised as one with room for intuition and innovation, much attention for monitoring and organisational learning, and empowerment of lower level staff and actors at field levels. In terms of funding, rules should enable more flexible spending at operational level, as this allows rapid response to ‘windows of opportunity’, with ex-post justification of spending based on accountability and transparency.

Figure 4.3 visualises how these two perspectives reinforce each other. The rational perspective is associated with the continuous, cyclical and iterative process of decision-making, building upon the rationality of multiple actors. It is supported by a deliberate and focused approach of creating suitable conditions for solutions to be developed (by research, education, awareness raising, networking, lobbying, partnerships, and communication platforms). The adaptive perspective is based on actor’s networks, societal dynamics and discourses, and the solutions, opportunities, compromises and decisions that come out of it. This requires a general alertness and receptiveness to unplanned events and moments that policy windows occur (through monitoring, early warning networks). The two perspectives reinforce each other to improve environmental qualities, but follow a chain of actions and results that are difficult to predict.

The insights generated in this section can now be summarised in a set of criteria to determine the quality of environmental governance. Table 4.7 lists these criteria, which come forward from the two perspectives elaborated before: the rational perspective (criteria 1 – 3) and the adaptive perspective (criteria 4 – 6). The criteria for environmental governance partly correspond to criteria for good governance. Environmental governance basically sets the conditions for environmental management to operate properly.
Table 4.7: Criteria and issues to assess the quality of environmental governance

<table>
<thead>
<tr>
<th>Main criteria</th>
<th>Issues involved</th>
</tr>
</thead>
</table>
| 1. Analytical soundness, reliability, consistency | • Strategic choices based on analytical insights (root causes, impacts)  
• Cost-effective, appropriate and effective approaches and instruments  
• Continuous updates to improve the quality of the data and information base  
• Consistency between the environmental management phases |
| 2. Coherence, focus, efficiency | • Coherence between elements and priority setting  
• Focus on critical social groups, environmental functions and ecosystems  
• Focus on win-win options, coalitions, innovations, and solutions  
• Efficiency of approaches and instruments |
| 3. Integration | • Integration of key issues of sustainable development  
• Integration within spatial planning and decision making processes  
• Integration into sectoral policies within a goal oriented strategy  
• Environmental standards for values that cannot be substituted |
| 4. Responsiveness, anchoring of social & political diversity | • Strengthening social action and available social forces  
• Responding to initiatives of civil society and the private sector  
• Stimulating and adapting to cultural and social diversity  
• Identification and rapid response to windows of opportunity |
| 5. Citizen participation and legitimacy | • Legitimate representation during the process  
• Ownership among all parties involved  
• Social networks for exchange, interactive learning and conflict resolution |
| 6. Accountability, communication, transparency | • Responsibility, professionalism, impartiality and balance  
• Transparency on the information base and decisions taken  
• Active communication between decision makers and civil society |
4.4 A FRAMEWORK FOR INSTITUTIONAL ANALYSIS

During a workshop organised by the World Bank on the institutional dimensions of environmental management (Santiago, 1999) the need was identified for a new orientation on environmental management, including “a conceptual framework with an outline of the ideal cycle of environmental management. This cycle should consider the contextual conditions, environmental policy and environmental priorities in government plans, instruments and governance issues”. This was the object of a study performed for the Inter-American Development Bank (IDB), with the aim to develop a framework to support public institutions in improving environmental management (Kessler et al., 2001). The analytical framework presented in this section is based on this study, and builds onto the insights developed in previous sections of this chapter.

The framework was designed to help institutions assess the quality of environmental governance and management, identify gaps, set strategic priorities and ‘translate’ these into specific plans for institutional reform and improved environmental performance. A framework with a limited set of criteria can help identify broad working parts and their posited relationships, to organise diagnostic and prescriptive inquiry (Ostrom et al., 1994), and can be used as an evaluative tool.

The analytical framework (Figure 4.4) basically consists of two components. Of both are analysed the current situation (reality) in its relevant context. For the environmental management structure, institutional and political factors constitute the relevant context, for the environmental management process, the governance situation constitutes the relevant context. The institutional analysis using this framework consists of making an assessment of both components by using the SWOT tool (strengths, weaknesses, threats and opportunities). It looks at the strengths and weaknesses of the current situation of environmental governance and management, and the opportunities and threats in the prevailing context. The assessment of both components is focused by using a limited set of criteria, as derived from previous sections. Strategic options for improvement are then defined as opportunities within the context to tackle weaknesses, or reinforcing strengths to anticipate upon contextual threats.

The process by which the framework is applied should involve stakeholders from different levels and sectors. Actively involving stakeholders in the assessment process strengthens mutual understanding and cross-sectoral exchange and stimulates policy fine-tuning. Secondly, it helps making use of different knowledge and information sources. The following working methods can be used:

1. Expert analysis, possibly including research, to provide the basis for further analysis and consultations that focus on key issues (e.g. the country studies carried out by IDB)
2. Consultations between public sector and expert groups, resulting in new or adjusted outcomes
3. Public disclosure and subsequent assessment workshops with direct stakeholders and interest groups (but without public sector or expert groups)
4. Tripartite workshops involving experts, public sector, interest groups and private sector.
This analytical framework can be compared with the frameworks for institutional analysis by Imperial (1999). He proposes a number of criteria to examine the performance of organisational arrangements dealing with environmental management. He states that performance criteria are more suitable than process criteria, as it allows for flexibility in the approach by which desirable goals are reached. To examine institutional performance at a certain point in time he proposes to focus on transaction costs, including information, co-ordination and strategic costs. To examine performance over a long period of time, the following criteria are proposed:

- Efficiency (in terms of productivity and wealth generation, and of administering the program)
- Equity (in terms of who benefits and how pays)
- Accountability (e.g. in terms of key actors monitoring and controlling each other)
- Adaptability (for adaptive management, learning and innovations).
- Desirable policy outcomes (e.g. ecosystem health or integrity).

It can be observed that in my framework equal attention is attributed to the rational, substance oriented perspective as to the ‘social’ perspective. The ‘Imperial framework’ has an added value by indicating how to judge the functioning of the institutional structure, by looking at transaction costs. My framework can be used as a self-assessment process by the organisations involved.
4.5 CONCLUSIONS

The field of environmental management changes towards a new so-called strategic model. Here the role of government changes from implementation, setting standards (norms) and regulations, towards a role of creating an enabling context for others to act. The approach is more pro-active, by the aim to incorporate environmental protection and management as a cross-sectoral issue into long-term economic and other sectoral policies. This new model of environmental management is associated with the concept of environmental governance at the highest (constitutional) level. It includes the setting of societal goals, principles and associated norms and regulations to create suitable conditions for governments to operate. It focuses at the decision-making processes involved.

There is widespread recognition of the fact that environmental concerns will need to be integrated into sectoral policies, as one major characteristic of the new environmental management model. However, there are several institutional reasons why this proves to be difficult (beyond the rhetoric at policy levels). At management and operational levels conflicting policies and interests generally lead to neglect or down-scaling of environmental concerns.

In Chapter 2 I pointed out the need for an adaptive approach to environmental management, and for resilience as a key attribute of the management institutions involved. Institutional resilience may be interpreted in terms of a certain flexibility of rules embedded within polycentric organisational arrangements. Specific for the environmental sector is the need for strong connections with social groups with an environmental focus (environmental NGOs, those representing victims of environmental degradation, indigenous communities, etc.). The adaptive perspective can be further characterised as one with room for intuition and innovation, attention for monitoring and organisational learning, and empowerment of lower level staff and actors at field levels. Management rules should enable more rapid and flexible response to ‘windows of opportunity’ at operational level, with ex-post justification of spending based on accountability and transparency.

The institutional aspects of environmental management and the characteristics of governance and decision-making processes were explored to develop an analytical framework that can be used to assess the quality of environmental governance, and to propose actions for improvement that are appropriate in their given context. The analytical framework presented in Figure 4.4 considers both the institutional structure and the decision-making process, and defines criteria for both components. Using this framework will help participants develop, monitor and adjust strategies in response to their specific institutional and governance context.

To put this framework into practice there are good opportunities to link up with decentralisation processes, but only where local governments are truly democratic and have the power to take real decisions. In that case there are better potentials for creating polycentric organisational arrangements for environmental governance, on the basis of shared benefits by the actors involved, than at national level. This then offers better potentials for an integrated approach (at regional or ecosystem level), which is particularly important for the cross-cutting sector of environmental governance. This would suggest that mainstreaming environmental issues into sectoral planning can best be initiated at decentralised level. The analytical framework constitutes a decision support tool to do so.

Now that I worked out what is required for environmental governance and management, in the next chapter 5 I will look at concrete tools and methods for analysis, assessment and planning purposes with an environmental focus.
5. ENVIRONMENTAL ASSESSMENT AND DESIGN METHODS

In previous chapters I reviewed relevant socio-ecological perspectives and concepts (Chapter 2), assessed from case studies (Annex I) the substance that should be the subject of planning processes (Chapter 3), and developed an analytical framework for the assessment of environmental management institutions and governance aspects (Chapter 4). All these have lead to ‘building blocks’ for the framework to be developed on environmentally sustainable planning and design. Now I will review existing tools and methods for planning and design. From the vast field of available methods, a selection has been made by the following categories (section 5.1 is on terminology).

Section 5.2. Environmental assessment methods
This section deals with formal methods of environmental assessment. Emphasis is given to Strategic Environmental Assessment (SEA), i.e. the assessment of environmental impacts at strategic levels, and two major challenges for its further development. One is the integration of environmental considerations at early moments of decision-making (‘upstreaming’), which brings us to an area where assessment and planning merge. The other challenge is to integrate environmental issues into development sectors, both in terms of substance and the assessment process. This brings us to methods of sustainability assessment and integrated (impact) assessment.

Section 5.3. Trends in environmental planning and design
In this section a review is presented of recent changes with respect to planning and design methods, based on experiences from both the Netherlands and developing countries. The focus of these methods appears to shift from the planning substance to the process. While the first is mainly a rational step-by-step approach, the second refers to a diversity of negotiation, communication and learning tools. The shift from substance to process has advantages but carries a risk of neglecting what planning should be about: improving sustainability.

Section 5.4. Three development models with case studies
Three development models will be reviewed and analysed on their planning and design methods: participatory land-use planning (with ‘gestion de terroir’ as one example), co-management involving negotiation between two parties, and integrated environmental management involving all actors within a certain area. It will be concluded that these approaches all have reached some successes, but still face major difficulties to help solve complex environmental problems and assure that environmental bottom-line standards are properly defined and respected.

Section 5.5. Conclusions
Four clusters of conclusions will form pre-cursors for my own framework: promising trends (to be strengthened and followed up), remaining gaps (to be addressed and ’solved’), pitfalls (to be avoided) and challenges (as a starting point to work out and evaluate my own framework).
5.1 TERMINOLOGY

First of all I will define the concepts of planning, design and assessment.

The usefulness of planning is to attain set goals in an efficient manner, by the best possible allocation of resources. ‘Planning’ in a generic sense refers to the process of systematically exploring future orientations, by defining goals and strategies (to resolve problems and realise opportunities), and designing measures and means to reach set goals (adapted from De Groot, 1987; Eggenberger and Partidário, 2000). The term ‘planning’ refers to the policy cycle (or normative cycle, management cycle, strategy cycle), normally with several components: problem and opportunity identification, analysis and explanation, design, assessment / appraisal of proposed solution/s or project/s, formulation, implementation, monitoring and evaluation. Figure 5.1 shows these components and two moments of design. This can be considered as symbolic for a cyclical planning process, which is desirable for planning in complex situations. Looking at this figure I want to highlight that:

- Planning *senso lato* refers to all activities from problem and opportunity identification until final formulation of a strategy or plan
- Design (or planning *senso stricto*) refers to the specific task of creating and formulating a solution strategy to address problem/s and/or opportunity/s.

Planning and design are not only technical activities but are also processes of creating what is appropriate. This process may vary from being autocratic (top-down) to interactive involving stakeholders and interest groups (this aspect will be further explored in section 5.3).

Assessment refers to an ‘act of fixing a value’ to a certain activity or design. Assessment takes place at a point in time of the policy cycle when a certain design (in a rough or in an elaborated form) is already there. Planning starts out from a given situation without any concrete design; it is based on the problems and opportunities, trends and dynamics, actor views and perceptions, etc. While assessment procedures are mainly reactive, planning is more pro-active and usually more creative.

The distinction between the different phases of the policy cycle refers to the variety of tasks that need to be performed. Planning should be cyclical, continuous and iterative to more efficiently address defined problems and opportunities in a changing context. Cyclical because subsequent planning cycles should feed into each other, continuous because contextual changes require adjustments of policies and strategies, and iterative because new knowledge or insights might require adaptations of earlier decisions (De Groot, 1987). Linear planning might be more effective to define all possible options (not overlooking any issues), but is more costly, less participative and therefore less efficient. Shorter planning cycles within a firmly established long-term vision and strategy would fit into an adaptive management approach.
Identification of problems and opportunities

Draft design of solution strategies

Ex-ante assessment of solutions / appraisal

Draft design of PP

Ex-post assessment of PP

Evaluation, major adjustment of plans

Monitoring, reviews, minor adjustments

Implementation of PP

Final (adjusted) formulation of PP

Analysis of problems and opportunities

Planning process

Figure 5.1: The position of planning, design, assessment and appraisal of plans or policies (PP) within a planning process
5.2 ENVIRONMENTAL ASSESSMENT METHODS

Environmental assessment is defined as “a systematic process for evaluating and documenting information on the potentials, capacities and functions of natural systems and resources in order to facilitate sustainable development planning and decision making in general, and to anticipate and manage the adverse effects and consequences of proposed undertakings in particular” (Sadler, 1996). Environmental assessment is a generic term that includes several methods (Box 5.1). Two methods that will be discussed here are environmental impact assessment (EIA) of projects, and strategic environmental assessment (SEA) of policies, plans and programmes. Then I will explore two challenges for further development of SEA. One is the integration of environmental considerations at early moments of decision-making (‘upstreaming’), which brings us to an area where assessment and design merge. The other is the integration of environmental issues into development sectors, both in terms of substance and the assessment process.

Box 5.1. An overview of environmental assessment methods

Formal or regularly applied methods for environmental assessment include the following:

- Environmental Impact Assessment (EIA)
- Strategic Environmental Assessment (SEA)
- Biodiversity Impact Assessment
- Biodiversity Impact Assessment
- Environmental Hazard and Risk Assessment
- Environmental Audit
- Environmental Profiles
- Environmental Overview
- Ecosystem Management
- Integrated Ecosystem Management
- Life-Cycle assessment
- Environmental cost-benefit analysis
- Environmental accounting
- Integrated impact assessment
- Integrated Assessment (IA)
- Integrated Environmental Assessment (IEA)
- Sustainability assessment
- Strategic Environmental Analysis (SEAN)

There are numerous informal methods for participatory and interactive area-based planning processes, many of which include aspects of environmental assessment. Only in the Netherlands, a recent inventory showed the existence of 37 different informal methods with proven results (ETC, 2000).
5.2.1 ENVIRONMENTAL IMPACT ASSESSMENT

Environmental impact assessment (EIA) aims to generate essential information for the decision making process in order to adjust proposed projects and interventions and to identify additional measures for mitigating and compensating negative environmental consequences\(^1\). An EIA consists of the following phases: screening, scoping, impact assessment, evaluation, monitoring and auditing. EIA is basically applied to relatively large (often infrastructural) projects. Box 5.2 provides information on how to address biodiversity issues in environmental assessment.

EIA has now been established as a formal requirement in the legislation of countries world-wide, followed by institutional strengthening and capacity building in this field. EIA regulations offer civil society a legal right to raise attention for environmental impacts. However, although every project now at least mentions how environmental issues have been considered, project designs are rarely altered in a fundamental way because the EIA study comes at a stage of the project cycle when much preparatory work and informal decision making (possibly including an ex-ante informal assessment) has been completed. EIA is occasionally little more than a project justification or mitigation exercise. An EIA is often weak on indirect, secondary and synergistic or cumulative impacts, and often fails to assess alternatives to the proposed project (Goodland and Tillman, 1995). Also, the proposed and frequently mentioned integration with social assessment rarely materialises in concrete terms (Goodland, 1999). Thus, EIA is not effective in terms of human inputs, as it drains energies of actors involved without having much effect.

**Box 5.2: Guidelines on biodiversity assessment (based on a summary of Worldbank, 2000).**

The key issues in biodiversity impact assessment are the expected magnitude of impacts (either quantitatively or qualitatively) and then the potential significance of the predicted impacts. To assess the potential significance of impacts on biodiversity, three dimensions are relevant:

- Impacts on biodiversity composition, structure and function (intrinsic, utility and structural values)
- Impacts at the four levels of landscape, habitat / ecosystem, species / population, and genes
- Impacts on current state and existing uses and pressures, and on existing management measures and policies

Biodiversity assessment requires particular attention to indirect, cumulative and long-term impacts, as these are often more significant than direct impacts. Knowledge about the reversibility of impacts (rate of recovery, resilience) is of major importance. However, on these issues many uncertainties still exist, partly due to the absence or unreliability of biodiversity data for specific situations, and the recent attention for these issues.

Species – area relations are particularly important. Species require a minimum size of suitable habitat to maintain viable populations, with sufficient genetic diversity to maintain resilience and evolutionary capacities in the face of contextual change and possible disturbances. This relates to the concept of ‘ecosystem integrity’, defined as the coherence of ecological structure and function, across its whole area, to sustain the complex of habitats and/or population of species. Generalisations emerging from island biogeographical theory (MacArthur and Wilson, 1967) highlight the fact that relations between biodiversity and area are different for isolated areas than ‘mainlands’. The biodiversity of isolated areas (islands, mountain tops, water bodies, etc.) is particularly precarious, with major risks when these are opened up or invaded. Also, as areas are fragmented, the viability of species populations decreases exponentially, which has lead to the need for ecological corridors.

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\(^1\) EIA can be defined as “a process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of proposed projects and physical activities prior to major decisions and commitments” (Sadler, 1996).
5.2.2 STRATEGIC ENVIRONMENTAL ASSESSMENT

Experiences with EIA that have lead to the development of Strategic Environmental Assessment can be summarised as the need (Dalal-Clayton and Sadler, 1999):

- To address environmental issues at earlier stages in the policy cycle, hence more pro-active
- To advance the principle of sustainability (integration with socio-economic concerns)
- To address cumulative and large-scale impacts and to develop alternatives at strategic levels.

Objectives and experiences

Strategic Environmental Assessment (SEA)\(^2\) has been designed to address environmental issues at strategic levels (i.e. of policies and strategic plans\(^3\)), that set the basic framework for project identification (Figure 5.2). SEA can be applied during earlier and more strategic phases in planning and decision making, across sectors and for a longer time perspective than EIA. SEA is applied after the initiator’s strategic objectives (of the plan) have been defined, and the initiator is responsible for its execution. SEA is particularly useful to assess large-scale, long-term, cumulative, synergistic and/or generic impacts, to define strategic alternatives (i.e. of policy choices) rather than project alternatives, and to incorporate sustainability considerations (Nooteboom, 2000). Sustainability and environmental considerations at the strategic level are expected to ‘trickle down’ to the project level by demonstrating the coherence of decisions at higher levels. The use of SEA thus reduces the time and costs needed at the lower assessment level. It also increases the transparency of the whole assessment process for the public and for stakeholders. SEA is useful for complex strategic plans that consist of several more or less distinct projects or interventions for which separate assessments would not be mandatory, unrealistic or inefficient. A good example would be a multi-sectoral rural development programme, generally with a range of different activities such as bore-hole drilling, infrastructure development, land rehabilitation, rural credit system, etc.. While these activities are not mandatory to EIA, together they can have large-scale and long-term impacts that need to be assessed before the programme is implemented.

The compatibility and efficiency of using SEA alongside EIA results from SEA addressing generic environmental issues at the higher tier of strategic decision making, and providing the focus and scope for refined environmental assessment at the lower tier of projects. This can be further explained by stating that SEA would mainly deal with the questions of why do anything (goals and objectives), while the what (methods and options), where and how questions are dealt with at the EIA level. It is argued that the ‘why question’ requires a different approach than the other questions (Verheem and Tonk, 2000). The ‘why decisions’ ask for more visionary and informal discussions, while the other questions ask for a well-structured approach with formal procedures, arbitration, independent review and safeguards. Impact assessment at the strategic level may have a more ‘broadbrush’ or qualitative character (Nooteboom, 2000). The informal, qualitative assessment might take place early in the process, as an ex-ante or interim assessment of solution strategies (Fig. 5.1).

\(^2\) SEA can be defined as “a systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives to ensure they are properly included and appropriately addressed at the earliest possible stage of decision making, on a par with economic and social considerations” (Thérivel et al., 1994; Sadler & Verheem, 1996).

\(^3\) Policies are broad statements of intent that define and focus the political agenda of a government and initiate a decision cycle. They are given substance and effect in plans, programmes and projects, which involve identifying options to achieve policy objectives and setting out how, when and where actions will be carried out (Dalal-Clayton and Sadler, 1999).
Early reviews of SEA applications (Sadler & Verheem, 1996; Thérivel and Partidário, 1996) showed that SEA is mainly applied to assess environmental impacts of sectoral plans and programmes, in the sectors of energy, transport and waste management. It was also been used to assess environmental impacts of local or regional development plans at strategic levels (Elling, 2000; Nooteboom, 2000). In the assessment process, use can be made of guidelines and standards of environmental action plans or policies (e.g. on maximum allowable impacts). Based on a review of experiences, Fischer (2001) makes the following distinction of SEA practice:

- **Policy SEA**: SEA fully integrated into project / policy planning cycle, mainly sectoral applications
- **Plan SEA**: SEA used for a comparison of spatial alternatives, mainly regional development plans
- **Programme SEA**: SEA for prioritising projects, e.g. using multi-criteria or cost-benefit analyses.

Fischer (2001) identified the following success factors for SEA application:

- Full integration of SEA in the procedures of policy / project decision-making process
- Early in decision-making process (the earlier the better)
- Consultation of external bodies / public participation
- Extensive use of both qualitative and quantitative methods
- Appropriate funding and sufficiently long preparation times.

The relations between SEA (strategic decisions) to EIA (lower tiers) is complicated because at a strategic level there generally is no decision-making system with a formal status. It is therefore probably best to apply SEA at those levels where the results and alternatives are real options (Nooteboom, 2000). There is great interest in environmental assessment at strategic levels (Brown and Thérivel, 2000). But there are few applications in developing countries. SEA may be particularly relevant to developing countries, where EIAs have been less successful and there is more need for efficient use of limited resources and capacities (Dalal-Clayton and Sadler, 1999). The diversity of SEA experiences has lead practitioners to think of SEA as an overarching concept, with an emphasis on the process rather than the product (that is, the report). Brown and Thérivel (2000) propose to define SEA as “a process directed at providing a holistic understanding of the environmental and social implications of the proposed project, programme or plan”. SEA can also trigger an institutional learning process through the debate on sustainable development issues (Bina, 2002). Given this broad understanding, SEA should be seen as a process in the context of which a family of tools may be applied.
Brown and Thérivel (2000) look at SEA as a creative design tool in the cycle of formulation and reformulation, and as a process, with decision-makers as active participants. A related challenge is that of integrating SEA into spatial planning processes, with integration of environmental, social and economic issues (Eggenberger and Partidário, 2000). But as SEA moves towards supporting integrated planning and policy making, its objectives may shift. This includes the question whether a formal, legal or an informal context best serves SEA objectives. Thus, there is need for guidelines that can assist practitioners in selecting an appropriate approach for a given situation and objectives. To do so research at the interface of SEA and policy making is required (Thissen, 2000).

**Generic principles for SEA**
The broad understanding of SEA requires a set of generic principles and goals for applying SEA, which also allows for flexibility in implementing SEA for planning, development and review purposes, adapted to the specific context (Thissen, 2000). Verheem and Tonk (2000) propose SEA generic principles and goals (Box 5.3). These reflect that SEA is in principle a method to assess the environmental impacts of existing decisions or designs. The approach of defining generic principles and goals rather than means and process requirements allows for flexibility in designing the SEA process for a specific situation. Important variables are the set objectives of decision making (policy, plan or program) and the contextual characteristics (e.g. extent of normative conflict, agreement on facts, decision culture, formality of procedures etc.).

**Box 5.3. Proposed generic principles and goals for strategic environmental assessment (Verheem and Tonk, 2000)**

<table>
<thead>
<tr>
<th>Principle</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening</td>
<td>An appropriate environmental assessment is carried out for all strategic decisions with potentially significant (positive or negative) environmental impacts, by the agencies initiating these decisions</td>
</tr>
<tr>
<td>Publication</td>
<td>It is clear to all parties affected by the decision how the assessment results are to be taken into account when coming to a decision</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Sufficient information on the actual impacts of implementing the decision is gained to judge whether the decision should be amended</td>
</tr>
<tr>
<td>Timing</td>
<td>The results of the assessment are available sufficiently early to be used effectively in the preparation of the strategic decision</td>
</tr>
<tr>
<td>Environmental scoping</td>
<td>All relevant environmental information is provided, and all irrelevant information is excluded, to judge whether an initiative should go ahead or whether the objectives of the initiative could be achieved in a more environmentally friendly way</td>
</tr>
<tr>
<td>Socio-economic scoping</td>
<td>Sufficient information on other factors, including socio-economic considerations, is available, either parallel to, or integrated in, the assessment</td>
</tr>
<tr>
<td>Views of the public</td>
<td>Sufficient information is available on the views of the public affected by the strategic decisions early enough to be used effectively in the preparation of the strategic decision</td>
</tr>
<tr>
<td>Documentation</td>
<td>The results of the assessment are identifiable, understandable and available to all parties affected by the decision</td>
</tr>
<tr>
<td>Quality review</td>
<td>The quality of process and information is safeguarded by an effective review mechanism</td>
</tr>
</tbody>
</table>
5.2.3 TOWARDS MORE INTEGRATED ASSESSMENT METHODS

Integration within SEA
When it is stated that SEA becomes more integrated, there is need to be more specific about what this really implies. Two closely interrelated aspects of integration stand out:
1. Integration towards earlier moments of design processes, this is the main issue for integrated environmental assessment methods
2. Integration with other dimensions and disciplines of sustainable development, this is the main issue of integrated impact assessment and sustainability assessment.

Moving SEA to earlier moments of the planning process is visualised in Figures 5.1 and 5.2. Although SEA is more pro-active than EIA, it is basically still reactive as it is applied after the initiator has made an initial design. The challenge is that of integrating environmental concerns at early stages of the planning process, when identifying the problem to be tackled or the opportunities to be realised. Even better, this should include the integration of environmental aspects into the design of the planning process itself (why, when, how, who, etc.).

The integration of environmental concerns with other sustainable development concerns (e.g. socio-economic) requires the active involvement of environmental and other disciplines at early moments of taking a development initiative. Integration then may start by assuring a common understanding of what environment is all about, and how it may serve long-term socio-economic development goals. There are arguments to consider environmental and social sustainability issues as a first tier of decision making, based on sustainability standards such as equity, biodiversity and resilience, while economic issues based on a cost-benefit analysis would appear as a second tier.

Table 5.1 summarises some of these findings, by giving some characteristics of what I would call ‘partial integration’ (as is commonly done) and ‘optimal integration’ (as I would like to see happen).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Partial integration</th>
<th>Optimal integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>When</td>
<td>Usually after an initiative has been formulated, broad policy choices made and goals defined.</td>
<td>From first moment, including the design of the planning process and definition of policy choices.</td>
</tr>
<tr>
<td>Position of environment</td>
<td>Environmental concerns are usually less important than (socio-) economic. This has implications for decisions taken at operational level.</td>
<td>Environmental and social sustainability issues at par or at a ‘higher’ level than economic issues. Designing ‘with the environment’.</td>
</tr>
<tr>
<td>How (process)</td>
<td>Environmental experts invited at a certain stage by the initiator, for a set exercise and period, starting and ending at set moments.</td>
<td>Environmental experts involved at earliest possible stage, including the design of the planning process, for an undetermined period.</td>
</tr>
<tr>
<td>Relations</td>
<td>Designers / initiators and environmental experts have different roles and status. Diverging interests are addressed at the operational levels.</td>
<td>Designers / initiators and environmental experts have equal roles and status. Diverging interests are addressed at strategic levels.</td>
</tr>
<tr>
<td>Outputs</td>
<td>Environmental criteria are used to avoid negative impacts, and/or address environmental opportunities.</td>
<td>Environmental criteria and opportunities are used in a pro-active approach to make strategic choices and enrich the design.</td>
</tr>
</tbody>
</table>
Chapter 5 – Environmental assessment and design methods

Integrated (environmental) assessment

‘Integrated Assessment’ (IA) aims to provide support at early moments of decision making processes by generating relevant insights and by interdisciplinarity. Rotmans (1998) proposes a generic definition: “a structured process of dealing with complex issues, using knowledge from various scientific disciplines and/or stakeholders, such that integrated insights are made available to decision makers”. It makes use of diverse approaches, and thereby distinguishes between analytical methods (e.g. analytical models and risk analysis) and participatory methods (e.g. policy dialogue).

Integrated Environmental Assessment (IEA) is part of the IA family. It basically focuses at assessing the current and future state of the environment to facilitate the design and implementation of policies and strategies. In order to better understand IA in general and IEA in particular, features of IEA as compared to SEA are highlighted in Table 5.2. It shows that IEA is generally applied in a more pro-active way than SEA, at earlier stages in decision-making and planning processes and in a more open-ended and cross-sectoral way. The two methods can be complementary by IEA defining environmental quality standards as part of an environmental policy, and SEA used to assess how these standards can be reached within sectors or territorial administrations (Figure 5.3). Applying SEA for sectoral or territorial plans requires credible environmental policies and standards, for which IEA can provide decision support.

Table 5.2: Comparison between integrated environmental assessment and strategic environmental assessment (based on on Nooteboom and Wieringa, 1999).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Strategic Environmental Assessment (SEA)</th>
<th>Integrated Environmental Assessment (IEA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>User (client)</td>
<td>Sectoral or territorial / administrative planning authority</td>
<td>Environmental authority, national or international, governmental or non-governmental</td>
</tr>
<tr>
<td>Goal</td>
<td>Integration of environmental issues into policies and plans by evaluation ex ante (before approval), usually within one sector</td>
<td>Decision support by assessment ex ante, indicating ways to integrate environmental issues, focus on inter-sectoral links and trade-off</td>
</tr>
<tr>
<td>Targets</td>
<td>Focus on driving forces and pressures, e.g. within sectoral institutions</td>
<td>Environmental quality targets for different sectors</td>
</tr>
<tr>
<td>Assessor</td>
<td>Initiator of the plan or policy, or commissioned by initiator</td>
<td>Independent scientific organisation</td>
</tr>
<tr>
<td>Quality check</td>
<td>Public review</td>
<td>Peer review</td>
</tr>
<tr>
<td>Approach</td>
<td>Analysis of proposed plan / policy, addressing the main impacts</td>
<td>Analysis of the main environmental problems, identifying main causes</td>
</tr>
<tr>
<td>Tools</td>
<td>Impact assessments</td>
<td>Impact identification, baseline assessment, early warning and monitoring systems, forecasting, scenario development</td>
</tr>
<tr>
<td>Policy options</td>
<td>Within the responsibility of the sectoral or territorial agency responsible for the plan / policy</td>
<td>Within the responsibility of any agency or actor</td>
</tr>
</tbody>
</table>

4 The European Environment Agency has defined integrated environmental assessment as: “the interdisciplinary process of identification, analysis and appraisal of all relevant natural and human processes and their interactions which determine both the current and future state of environmental quality and resources on appropriate spatial and temporal scales thus facilitating the framing and implementation of policies and strategies” (EEA, 1995).
Integrated impact assessment aims to assess the impacts of proposed interventions on sustainable development (social, economic and economic dimensions, their interactions and trade-off). It links up to what others refer to as sustainability assessment. Sustainability assessment may be defined as “a generic term which embraces the aim of assessing the extent to which plans are able to satisfy the goals and imperatives of sustainable development, particularly the integration of environment and development in decision-making” (Dalal-Clayton et al., 1994). The approach is still largely re-active, similar to SEA, but inter-disciplinary and more holistic in terms of issues being covered.

Integrated impact assessment now appears to be a generic term for addressing various integration issues. At least three aspects are involved (Eggenberger and Partidaro, 2000; Bond et al., 2001):

1. **Substantive**: the integration of environmental (biophysical) with social, economic and other issues, also at different scales (from local to global) and time perspectives, and dealing with uncertainties. Some would refer to the integration of different issues as a ‘holistic’ approach.
2. **Procedural**: the integration of environmental attention in planning and decision-making processes (when, how, by whom), the agencies and the legal issues involved.
3. **Methodological**: the integration of different approaches, concepts and terminology, and the involvement of key actors at different intensities and points in time.

As stated above, so far most attention has been given to the substantive aspects, in line with sustainable development objectives. Here, integration can be weak or strong (Lee and Kirckpatrick, 1997). Weak integration would imply that separate appraisals are undertaken and the decision-making authority has considerable autonomy in deciding how these appraisals are ‘integrated’. Strong integration would imply that during the process methods are integrated and the decision-maker uses the overall appraisal to take a decision. It is concluded that current practice and methodological developments are much closer to the weak end of the spectrum (Bond et al., 2001).

With respect to the procedural aspects, experiences show a tendency for assessment to move ‘upstream’, i.e. to take place earlier in decision-making and planning processes. As a result, assessment and planning processes tend to merge and overlap. This would also have consequences for who is involved at what stage of the assessment process.
As regards methodological aspects, strong integration requires an inter-disciplinary and participatory approach. Here, a main hurdle to take is the diversity of development visions and belief systems of different disciplines, which tend to surface particularly at moments in the process when decisions are to be taken. It is proposed to maintain a high frequency of inter-disciplinary interaction, select experts and participants with an open mind, avoid time constraints, and undertake the assessment in a neutral setting, with an independent body responsible for co-ordination of the process and final responsibility. Contacts between different parties should be established at early moments of the process, possibly including the provocation of cross-disciplinary conflicts (Post et al., 1998).

So far there has been limited participation in economic appraisal, and participatory processes in environmental and social assessment are poorly developed (Bond et al., 2001). Yet, there is agreement on the need for more participation in assessment and planning processes, to enhance ownership, influence decision-makers, stimulate collaboration and networking, activate actors involved, ensure institutional ‘rooting’ and raise awareness. A blend of analytical methods (quantitative) and participatory methods (qualitative) is required to address complex problems and to deal with uncertainties (Ravetz, 1998). Linkages to adaptive management, with elements of monitoring and early warning are mentioned (Rotmans, 1998). To develop these methods there is need to learn from existing decision-making processes (Brown and Thérivel, 2000), as I reviewed in Chapter 4.

Clearly, these 3 forms of integration reinforce each other, and therefore cannot be dealt with in isolation. Particularly in developing countries, integration in all three respects would be desirable, as here social and economic well-being (in its broadest sense) are strongly associated with maintenance and management of (agro-) ecosystems upon which livelihoods and human society closely depend. In particular, there are common interests between environmental and social assessment, and the methods should be merged where possible (Goodland, 1999).

5.2.4 CONCLUSIONS

As a follow-up to EIA, SEA aims to assess environmental impacts of proposed programmes, plans, strategies or policies. Although the use of SEA aims to become more pro-active, in most cases it deals with environmental issues when broad policy decisions and choices have been made (ex-post assessment) (Figures 5.1 and 5.2). For the initiator this will give the impression of the environment as a development constraint. Integration is a key word associated with attempts to overcome this weakness. The aims for integration can be summarised as follows.

1. Substantive integration. Methods claim to be integrated and holistic in terms of dealing with environmental, social and economic issues in a balanced way. However, the critical question is that of the importance (weight) of environmental sustainability issues as compared to the other dimensions, and whether in case of conflicting interests integration is sought or a choice is being made. Environmental and social sustainability norms and standards are required at a first tier of assessment processes, to avoid that these issues are neglected.

2. Procedural integration. This refers to the consideration of environmental issues in earlier phases of planning and decision making (‘upstreaming’). Here, IA and IEA are methods for providing decision support at early moments, and can thus strengthen and focus SEA (Figure 5.3). However, these methods are not integrated in the overall design or planning processes, but are applied as a separate exercise before policy decisions are taken.
3. Methodological integration. This refers to participation in the assessment and planning process, using a blend of analytical methods (quantitative) and participatory methods (qualitative) to deal with complex problems and uncertainties.

It seems that, given these challenges that lie ahead, both the complexity of the methods and the criteria to be met by the process increase. Procedural, substantive and methodological integration, as explained above, are all required for ‘mainstreaming’ environment into development policies. However, integration is not a matter of adding up the different elements, but of adjusting the elements to create synergy. But to achieve such synergy might require totally new ways of looking at decision-making and planning, away from simulation and prediction, towards more heuristic exploration and learning processes (Ravetz, 1998).

Secondly, there is need for empirical evidence of the real impacts of applying environmental assessment methods at the interface with strategic planning and policy making (Thissen, 2000; Fischer, 2001). This is particularly relevant for developing countries, where existing EIA-based methodologies have been less successful and where there is need for more efficient procedures due to limited resources and capacities.

In the next sections I will deal with trends and new ideas to improve the planning and design process (section 5.3), and review concrete case studies with different planning and design methods.
5.3 TRENDS IN ENVIRONMENTAL PLANNING AND DESIGN

In this section a review is presented of recent changes with respect to planning and design methods, based on experiences from both the Netherlands and developing countries. The focus of these methods appears to shift from the planning substance to the process. While the first is mainly a rational step-by-step approach, the second refers to a diversity of negotiation, communication and learning tools. The shift from substance to process has advantages but carries a risk of neglecting what planning should be about: improving sustainability.

5.3.1 TOWARDS INTEGRAL AND PARTICIPATORY DESIGN APPROACHES

The neo-classical planning approach
Planning is a tradition as old as mankind itself. In its classical formalised tradition planning was autocratic (top-down) and the exclusive responsibility of specialists and those in power. In line with this tradition, in developing countries plans were often made by donors or foreign consultants. In the tradition of 5 year plans, a strategic plan would be formulated for 5 years, with annual or operational plans based on that. A plan should be implemented in a strict sense, with little room for flexibility. Planning was done for separate sectors with little attention for inter-sectoral issues. Basically a rational and linear (step-by-step) approach was followed, from analysis to problem definition, solutions, implementation etc.

Spatial planning, as one important component of a planning process dealing with natural resources, aims to allocate different resource-use functions and activities to specific locations. Spatial planning has a tradition of a systems engineering approach, characterised by surveys, inventories, mapping, and the use of land-use systems and geographical information systems. Characteristic is also that qualitative factors (such as lifestyles and non-material environmental values) are not considered, as these are difficult to quantify.

Neo-classical paradigms of planning are still basically linear and based on rational considerations, but include several new elements such as simulation and predictive models of the future to involve views and ideas from different disciplines and people. These are based on rather simple system dynamics, the extrapolation of current trends, on a few well-defined variables and containing assumptions on system equilibrium, such as human preferences and environmental stability.

New directions
The current existence of many protected areas is just one example of the usefulness of the classical or neo-classical planning approach. However, the disadvantages and weaknesses have also become clear. First of all the need for real participation and interaction during the planning process became apparent, to acquire a broad sense of ownership and commitment to successfully implement the resulting plans. This has resulted in a range of participatory planning approaches, with variable degrees of participation. Secondly, the need for inter-disciplinarity became clear as a sector cannot anymore be considered in isolation from other sectors and disciplines. These two aspects still fall within the neo-classical planning approach, as a rational and linear planning structure remains the basis.

The concept of planning has become subject of debate. It has been observed that in practice reality does not follow plans, but plans follow reality. For instance, in the urban sector many UK cities base their recent success on ‘cultural industries’, many of which are unregistered, clandestine and verging on illegal activity. Post-industrial cities and regions are increasingly interconnected and in competition, and many of the factors in local advantage are the more intangible factors of image, entrepreneurial resource and quality of life (Brindley et al., 1996).
These changes correspond to the move from a period of ‘normal science’ during which people agree on a fundamental paradigm and occupy themselves with questions within this paradigm, into a period of ‘post-normal’ science, during which the paradigm itself is contested. Funtowicz and Ravetz (1994) argue that we have entered a period of ‘post normal’ science because ‘normal science’ cannot deal with the current complexity and uncertainty (e.g. multiple goals, multiple interest groups, multiple levels). The emphasis shifts from the planning substance to the planning process, and from finding the best means to reach certain goals to the process of learning and public debate about the goals and the underlying assumptions.

As regards the planning substance, new planning directions pay attention to scenarios and visions\textsuperscript{5}, with in-built flexibility and attention for different dynamics involved. As regards the planning process, more attention is given to negotiation processes, consensus building, knowledge generation, capacity building and education. These are considered conditions for voluntary change towards more sustainable (spatial) plans and policies. The emphasis is away from simulation or prediction, towards more heuristic exploration and learning processes (Batty, 1995; Ravetz, 2001).

Experiences and lessons learned from the planning of national sustainable development strategies, green plans and the like, have been quite different in industrialised and developing countries. While in industrial countries governments have adopted variable approaches depending on existing government practices and specific interests and objectives and are mainly environmentally oriented, in developing countries the approach has been much donor-influenced, has been more consistent and development oriented (Dalal-Clayton, 1996). From experiences in northern and southern countries, the following lessons for successful planning processes were drawn (Carew-Reid et al., 1994; Margulis and Bernstein, 1995; Dalal-Clayton, 1996):

1. Focus on critical environmental problems, diagnosis of underlying root causes, and finding cost-effective, feasible solutions
2. Adopt a cyclical approach of planning and action, with an emphasis on managing progress towards sustainability goals, rather than producing one ‘plan’ or end product
3. Be multi-sectoral and integrative (in terms of environmental and broad development objectives)
4. Involve the ‘widest possible participation’, at least key actors at local level, sharing responsibility and building partnerships
5. Ensure institutional ‘rooting’, by improving institutional performance, human capacity development, mobilising financial resources, and ensuring monitoring and evaluation

In the next sections a brief overview will be given of the current ideas and concepts with respect to new planning approaches. I will do so by first giving one example of the water sector in the Netherlands, and then highlighting new ideas that come forward from different disciplines: policy making, communication, negotiation studies, and adaptive management.

\textsuperscript{5} An ‘alternative’ is a forecast or projection of current trends. A ‘scenario’ is a rich and detailed portrait of a plausible future state including assumptions of what might happen. A ‘vision’ is a powerful mental imagination of the future desired, visualised or described, which gives direction to the strategy.
5.3.2 THE EVOLUTION OF PLANNING IN THE WATER SECTOR IN THE NETHERLANDS

The evolution of planning for water management in the Netherlands may serve as a reference for how natural resource management and planning have evolved. Van Rooy (1997) describes the changing role, functions and approaches to planning in the water sector by the following historical phases:

1. **No water management.** Land is plentiful and there are no limitations in water quality and quantity. No planning is required.
2. **Basic water management.** As land resources become scarce due to growing population pressure. Planning aims at controlling surface waters to create sufficient and secured land resources.
3. **Sectoral water management.** During the industrial revolution and subsequent period of economic growth water resources are subject to increasing pressures for various economic functions, leading to social and environmental problems. Planning focuses at both surface and ground-water in terms to meet both water quantity and quality goals.
4. **Integrated water management.** As problems intensify during the 20th century, the previous approach does not suffice because impacts and causes of problems are found beyond the water sector. The new approach developed therefore aims at managing and maintaining secure and resilient water systems in their spatial, social and institutional context. Key words are ‘sustainable’ and ‘systems approach’. Planning focuses at defining key functions for water systems, and based on that goals, activities and supportive measures in different sectors, to optimise these functions.
5. **Comprehensive water management.** The previous approach proves little successful where multiple major functions are involved. The new approach now being developed focuses at the interaction of driving forces, within ecological, social and economic sectors and dimensions. Planning looks at the existing dynamics within these dimensions, and does not aim to reach pre-set goals.

Planning within the comprehensive water management approach is based on a number of substance- and process-oriented criteria:

- Area-based approaches, with a major attention for spatial planning aspects
- Goals and solutions are specific for different contexts (no standard solutions), and are dynamic
- Solutions are based on ecological principles and integral economic valuation of costs and benefits
- Focus on processes with wide participation of societal groups
- Interaction between management institutions and society for transparency and accountability
- Open communication and networking between institutions and actors to improve collaboration

These considerations have lead to a framework with steps to structure planning in the water sector (Fig. 5.4), referred to as ‘Interactive Planning aimed at Effectiveness and Acceptation’ (Van Rooy, 1997). This framework integrates four different perspectives: a system-analytical, a process-analytical, a normative-philosophical and a learning perspective. It can be considered as exemplary for planning approaches in several resource management sectors (ecosystem management, fisheries, rural planning, tourism). The approach claims to be flexible, in terms of the design process (e.g. iterative relations between the planning steps), and the resulting plan (which is dynamic in a changing context).

Figure 5.4 shows that the system-analytical perspective predominates. Van Rooy (1997) mentions that the other three perspectives can be recognised by the attention for communication and interaction, attention for assumptions and preconditions, and by learning tools. However, the tools to meet requirements for these other perspectives are clearly sub-ordinate to the system-analytical framework. Tools for participation, communication, networking, interaction, negotiation, conflict resolution, collaboration and learning are meant to help execute analytical steps. The steps give a pre-defined neo-classical structure and chronology to the process that has a goal-oriented and linear character.
5.3.3 NEW IDEAS FOR PLANNING FROM DIFFERENT DISCIPLINES

Communication science – communication platforms
Conceptually, attention for communication can be traced back to the notion of communicative action (Habermas, 1981). According to Habermas instrumental action is behaviour which involves the following of prescriptions to reach certain predefined goals. Strategic action still focuses on predefined goals, yet is different because actors recognise other actors as strategic partners or opponents, in stead of as objects. Communicative action aims to reach agreement or consensus on a shared definition of a situation, a common goal and collective action. This results from an open debate and a social learning process. While the first two concepts are based on the predominance of self-interest, communicative action focuses on collective interests.

From a communication perspective, most important is to bring together the relevant actors in a setting that stimulates communication and effective exchange. The underlying assumption is that improving communication and participation will lead to improved insights, understanding, awareness, acceptance, etc. through negotiation, collective learning and other social processes. This will
eventually support self-organisation, collaboration, partnerships, action and networking, leading to (more) innovative action and desirable change. Communication aims to stimulate interaction and social learning by ‘activating the context’. Tools and methods to do so are communication platforms, arenas, theatres or round tables, where actors meet, communicate, discuss, negotiate and try to agree upon actions. Communication platforms stimulate social aggregation and the creation of collective agency (Röling, 1997). It is assumed that interaction within platforms stimulates effective innovation (as compared to the classical approach of research, training and extension). Communication platforms have a political and ideological context of making available existing local knowledge and developing countervailing power at the local level, e.g. by stimulating self organisation (Röling, 1994).

Communication may work best through ‘platforms’ nested in each other (by representatives), possibly forming a system from local to supra-local and international levels (De Bruin et al., 1998). There are several approaches based on communication and participation, with slightly different focus, such as participatory rural appraisal (Chambers, 1994), participatory technology development (Jiggins and De Zeeuw, 1992) or participatory action research (Rahman, 1993). One related approach is RAAKS (Rapid Appraisal of Agricultural Knowledge Systems) (Engel and Salomon, 1993). RAAKS focuses on the functioning of inter-institutional knowledge networks. The RAAKS process basically consists of the following steps:

1. Relevant actors form a communication platform and accept support by a research team
2. A shared perspective is formed about the problem situation, with clarified roles for each actor
3. Agreement is acquired about the potentials to develop a solution by collaboration
4. Concrete actions are agreed upon with set tasks and responsibilities.

During this process operational tools from RAAKS are used to jointly analyse and study relevant issues and identify actions. One important tool is an actor’s analysis. The aim is to map for the different actors involved: roles or functions, interests, visions, implicit and explicit knowledge base, information sources, institutions, attitudes, relations and influences. It should also include the mapping of power relations between actors, with indication of the degree of power, sources of power, and means of enforcing and pursuing power.

Conceptually, it is useful to distinguish two different styles of communication, interaction and collaboration between actors (De Groot, 1999). One is the contractual style, whereby actors are seen as parties with different interests. Parties negotiate to agree upon rules, roles and rewards, possibly resulting in a concrete contract. The other is the relational style, whereby actors are seen as having different visions, but with mutual relations. Here actors exchange stories and interpretations to reach a shared view on the problem and its possible solution/s, and agree on actions based on mutual trust. These two styles are related to two organisational principles for creating synergy between different parties, namely complementarity and embeddedness (Evans, 1996). Embeddedness emphasises the fact that human behaviour is embedded in its social context; decisions are taken on the basis of social requirements, cultural norms, mutual trust, informal relations, etc. Complementarity emphasises rational choice and individual interests. Evans (1996) suggests that both principles are necessary for environmental management: complementarity for clarity about the required tasks by the various actors in a collaborative approach, embeddedness for the social energy to undertake collaborative actions.

Based on my experiences with communication platforms, I raise some critical remarks:

- Most platforms occur at the local level. The scaling up of these platforms to higher levels, or the establishment of linkages between local platforms and higher level networks or institutional settings, is still a matter of major concern.
• Sustainable development is considered as one emergent property of platforms (a constructed reality) (Röling and Wagemakers, 1998). However, whether communication will lead to collective action for improved environmental management is less likely as natural resources become scarce and conflicting interests become the rule rather than the exception. The promise of communicative action is based on the assumption that collective interests are stronger than self-interests, which often does not seem to be the case.

• Change is largely assumed to result from communication, thus communicative competencies, equal access to information and a suitable communication context are critical. Obviously there are disparities in terms of communicative competencies, between individuals, gender, ethnic groups and cultures, and a safe and trusted context will not always be easy to create.

Policy science – interactive policy making
What do participation and interactive policy making mean? Pretty (1993) makes a distinction between different types of participation, from information gathering, participation in consultation, participation for material incentives, functional participation, interactive participation and self-mobilisation. In this order the intensity of exchange on an equal footing increases. Based on a review of development efforts Guijt (1991) found that in most cases external agencies control participation, which demonstrates that functional or interactive participation not common.

Pröpper and Steenbeek (1998) propose a ‘participation ladder’. They state that for interactive planning to have desirable impacts, openness is required in three ways, and as these characteristics improve one can speak of interactive policy making:

• Room for new ideas, plans and means
• Transparency of the process, open access to information
• Open arena for participation by various actors.

Interactive policy making aims to actively involve civil society, private sector and public services from different levels, into the process of policy preparation, planning and design (Kornov and Thissen, 2000). The aim is to shift attention in public involvement from participation at the end of the process towards early stages. New approaches have evolved for several reasons. First of all, there is growing concern that government is failing as a democratic forum for public opinion and decision-making and that the public has become estranged from the political arena. Many policy studies are still being performed by experts in their offices. Secondly, there is a decline of public support for political decisions, and growing opposition against certain government decisions. Thirdly, government is loosing its traditional power in a fragmented society with increasingly complex interdependencies between stakeholders in policy ventures. There is a call for more policy-making by negotiation.

It is assumed that stimulating interaction, learning and creativity has positive impacts on:

1. Concrete results, by increased richness of information and creativity, innovative solutions, building a knowledge base, effective feed-back on results and impacts as part of a learning process
2. The public process, by increased acceptance by participants, improved efficiency and an increased democratic character of public decision making.

In the Netherlands during recent years several well-described methods for interactive policy making have been tested and reviewed (Enserink et al., 1997; Klijn and Koppenjan, 1998; Pröpper and Steenbeek, 1998; Enserink, 1999; Monnikhof and Edelenbos, 2001). Interactive processes generally follow a certain process design, involving four components (Table 5.3).
Table 5.3: Components of an interactive policy-making process (based on Edelenbos and Monnikhof, 1998)

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
</table>
| 1. Demand: finding out what relevant actors want, and trying to work this out into policy alternatives | • Process design, agreements on collaboration  
• Conditions, norms and standards to be met  
• Actor analysis, with interests and relations  
• Problem inventory and priority setting, problem statements |
| 2. Design: letting actors participate in the creative process of (re)designing solutions, but also in (re)designing the problem statement | • Analysis of problems (and opportunities)  
• Generating creative solutions and scenarios  
• Feed-back by public  
• Institutional / organisational implications |
| 3. Deal: involving actors in the negotiation on solution packages with benefits for everyone | • Negotiation of realistic and acceptable solutions  
• Identification of mitigation or compensation measures  
• Evaluation of solutions by interest groups  
• Setting priorities |
| 4. Decide: involving actors in the final decisions to be taken on solutions and policies | • Screening of solutions  
• Policy making and detailed planning  
• Implementation, monitoring and evaluation |

A high degree of representativity is required for democratic policy making. However, in many cases representativity was not optimal, with certain social groups being poorly or not at all represented. In other cases, government or the initiator itself was absent. This leads to the question of who are the relevant actors in an interactive planning process, and how these can be properly represented. Kornov and Thissen (2000) mention the following criteria for relevance of participation:

• Their formal position, e.g. a Government authority  
• Their control of relevant resources, e.g. natural resources, financial resources  
• Their power to hinder or block implementation, e.g. pressure groups  
• Their stakes in the issue (stakeholders and other actors)

Experiences with interactive planning in the Netherlands generally showed some positive impacts as regards the process, but less on the concrete product. Participants were satisfied because they are respected by being involved and receiving information. However, there are doubts about the real influences of public inputs on policy making (e.g. Monnikhof and Edelenbos, 2001). In most cases, many of the issues raised by participants got lost somewhere in the process, actual design was dominated by experts, and the influence of stakeholders on priority setting and policy making was unclear and not transparent. In a general sense, the ‘negotiation space’ is often considerably confined by the interests of the initiator and existing legal procedures or policies. Too often interaction and participation in fact aim at generating commitment for pre-defined goals and options, rather than defining common goals and new options. In fact, in many cases the initiator is not really interested in the outcomes of the process, but considers public participation as a democratic requirement, to give a pre-defined plan legitimacy of public support. In other words, ‘political-instrumental’ or ‘democracy-enhancing’ objectives predominate over those of improving the plan (output) or generating real commitment. As a result, the initiator is mainly concerned with protecting its own negotiation space and freedom to decide in the end, rather than incorporating innovative solutions or designs. This attitude is reflected in the process design, with limited room for participants to create own options.

6 Immigrants, women, young and elders are often underrepresented (De Bruin et al., 1998).
### Table 5.4: Arguments to communicate or not, for the State and civil society (based on Woerkum, 1997)

<table>
<thead>
<tr>
<th>Decision maker / State</th>
<th>Participants / civil society</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arguments not to communicate / interact</strong></td>
<td><strong>Benefits are unclear in relation to the time and financial inputs</strong></td>
</tr>
<tr>
<td>• Loss of power (ability to ignore others)</td>
<td>• Interaction is difficult, the issues are complex</td>
</tr>
<tr>
<td>• Conflicts become manifest</td>
<td></td>
</tr>
<tr>
<td>• Interaction takes time</td>
<td></td>
</tr>
<tr>
<td>• Non-rational arguments will interfere</td>
<td></td>
</tr>
<tr>
<td><strong>Arguments to communicate / interact</strong></td>
<td><strong>Gain of respect (possibly power and access to information)</strong></td>
</tr>
<tr>
<td>• Increase acceptability of policies</td>
<td>• Commitment for a public cause</td>
</tr>
<tr>
<td>• Improve legitimacy of decisions</td>
<td>• Learning from others</td>
</tr>
<tr>
<td>• Delegate responsibilities and tasks</td>
<td>• Social interaction and networking</td>
</tr>
</tbody>
</table>

The Dutch ‘polder model’ is often considered as ideal for public negotiation and conflict resolution between different parties involved, and indeed many successes have been achieved. However, there are strong doubts whether a ‘green polder model’, involving environmental NGOs, government and the private sector, has been successful to solve environmental problems. A review of experiences leads to the following conclusions (Duyvendak et al., 1999):

- Relevant actors are involved too late in policy making processes. As a result, creative inputs come too late, commitment is not built up, and major policy choices have been made.
- Major long-term dilemmas like the conflicting relationship between environment and economic goals are not subject of public debate, and real choices are not made. Only short-term dilemmas are discussed and apparently ‘solved’.
- Decision making is not transparent and citizens are not taken serious or fully involved and informed.

For actors there are arguments not to communicate with other parties, or instead to do so, as indicated in Table 5.4 for the State and civil society.

Both decision makers and participants often consider interactive policy as time-consuming. While this may be true in the short term, it is not true in the long term as greater commitment and better planning will pay back during implementation. Yet, decision makers want rapid planning processes. For that purpose Enserink et al. (1997) developed a quick scan interactive methodology for participation in impact assessment, which consists of a combination of inputs and alternatives proposed by the initiator, and interactive moments whereby participants take decisions or propose adjustments. Stakeholder knowledge and experiences are used at different stages to enrich and adjust proposals, including the redefinition of the problem and alternative solutions.

Interactive processes are relatively complex. Partly based on Pröpper and Steenbeek (1998) I have some suggestions to improve interactive decision-making:

1. The decision maker (or initiator) should be involved during the whole process as one key actor.
2. There should be transparency with respect to limiting conditions as regards the substance, e.g. financial resources, existing policies and decisions, legal requirements, timing, environmental or social standards. Participants should know their room for manoeuvre and the contours of the interactive process. If these conditions appear at the end of the process it frustrates participants.
3. There should be transparency as regards the process: how inputs from participants will be dealt with, what roles and tasks for different parties, how decisions will be taken, how opposing views will be dealt with, what are possibilities for feedback, etc.

4. To stimulate participation, the initiator may introduce a general problem description and a few rough solution directions. Participants can be stimulated to translate their own wishes and demands into clear criteria, which are then used to assess the proposed solution options.

5. If external parties are required to carry out this research, these must be trusted by all parties, be reliable and transparent. Ideally participants carry out their own research (joint fact finding).

**Negotiation studies**

In spite of the evolution towards more participatory processes, the results of these new approaches are often disappointing. This obviously depends upon the defined success criteria, e.g. with respect to the degree of desirable innovation, social change and sustainability of the results. Some believe that current problems can be solved by gradual change and small innovations, and they would be satisfied by small improvements (limited by scale of adoption and/or time horizon). But sometimes there is need for fundamental (revolutionary) social and policy change and reorganisations (‘architectural innovations’). To achieve such change some claim the need for another approach.

One reason explaining the limited capacity to bring about major social change might be that participatory methods are based on similar underlying concepts. They are all based on planning and decision making models (with respect to concrete results) and social learning models (with respect to the process), characterised by the following elements (Leeuwis, 2000):

1. Participatory trajectories within a planning process, with phasing, tools, and modes of participation subordinate to concrete decision making
2. The belief that change will be achieved if social learning is stimulated, assuming that the lack of knowledge and skills are key obstacles towards sustainable development change
3. Participation by all actors and a focus on communication and social learning to reach shared insights, common agreement or consensus.

Possibly, environmental management should be seen as a struggle and negotiation process between social groups with conflicting interests, with unpredictable outcomes, rather than a process of achieving consensus on goals and collective action. It is questionable whether design processes with participatory and communicative tools as proposed are sufficient to support such a negotiation process. Negotiations are about power and arguments. There may be more fundamental problems to be resolved, such as creating favourable conditions for negotiations on an equal basis. Leeuwis (2000) argues that success of participatory (planning) processes depends mainly on contextual conditions, such as the power relations, the availability of funds for follow-up activities, the legal context, external pressures, etc. and not on communicative rationality and social learning.

It is argued that the organisation of participatory trajectories should be based primarily on negotiation theory (Leeuwis, 2000). This implies, first of all, a focus on the context of the negotiation process, to create suitable conditions for decision making and social learning. This refers to institutional, emotional, cultural, psychological and political aspects, besides the cognitive aspects that dominate current planning approaches. Secondly, there will be parallel learning and negotiation trajectories, between different parties, on different issues and at different moments, to come to concrete decisions. Thus, there will be multiple ‘negotiation platforms’ at different levels. Thirdly, while according to communicative action theory the moderator plays a facilitation role, enhancing communication and learning, according to negotiation theory the moderator also needs to avail of resources and a power-base to forge concrete decisions.
These considerations have lead to a framework with tasks to facilitate an integrative negotiation and design process (Figure 5.5). To successfully organise design processes involving parties with conflicting interests, parties must feel mutually interdependent to improve a given situation (Aarts, 1998). In other words, they should see clear benefits for negotiation based on self-interest, or see no other option than to work together. Considering the multitude of arguments not to communicate and negotiate with others (Table 5.4), additional pressure may be required to shift the balance. Pressure may come from the urgency of ecological trends or events (e.g. an environmental calamity), existing policies (e.g. poor access to benefits) or trends (e.g. increasing population pressure) or external pressure (e.g. by environmental or human rights NGOs).

Adaptive management perspectives
The concept of adaptive management and its origins was introduced in section 2.5. It stems from the insight that systems are inherently complex and unpredictable, and planning has limited capacities to anticipate on future issues. There seems to be a fundamental mismatch between goal-oriented planning and the complexity and uncertainties of adaptive systems. Geldof (2002) identified the following weaknesses of goal oriented planning methods:

- Distinction between planning and implementation, with no possibilities for adaptations
- Means are subordinate to set goals, with limited attention for how means work out
- Central steering, with a tendency for uniformity and standardisation
- No capacity to deal with intuition, creativity, new opportunities and insights
- Difficulties to create real innovations for persistent problematic situations.

The ultimate target of adaptive management is to restore, maintain and/or strengthen human sensitivities and capacities to respond to feedback from environment, at different levels (individuals, groups, communities, organisations and institutions). A range of ideas are being tested to enhance ‘adaptive management capacities’ within organisations (e.g. Gunderson et al., 1995; Roome, 2001), including the need to:

- recognise adaptive cycles in organisational development and recognise ‘opportunities for change’ at certain development phases
- create networks at different levels, as well as partnerships, co-management arrangements, coalitions, platforms, etc. to stimulate interaction and learning
• create networks between organisational levels within great spatial scales and time spans, so that local level processes feed into higher levels
• develop an institutional context that supports collective learning, including devolution of decision making and good governance principles
• stimulate innovation, emotional commitment and entrepreneurial action (to avoid systems becoming overconnected and rigid).

5.3.4 CONCLUSIONS ON NEW METHODS

From the above review I conclude that a neo-classical system-analytical perspective must be integrated with a process-analytical and learning perspective. There are tools and methods available for both perspectives (Figure 5.6). The challenge is how tools and methods from both perspectives can be combined (e.g. in a sequence) to reinforce each other on mutual strengths. The method for comprehensive water management in the Netherlands, for instance, largely represents the system-analytical perspective, while the communicative framework focuses at the second perspective. Both approaches are relevant for certain situations, but decision-makers should be aware that in most cases one of the two perspectives receives primary attention, and the other perspective is sub-ordinate.

Figure 5.6: Two perspectives with associated planning tools and methods
For the process-analytical tools and methods the organisational principles of complementarity and embeddedness provide a useful analytical structure. The methods coming forward from communicative action are based mainly on the principle of embeddedness, i.e. social trust and informal linkages. The methods coming forward from the negotiation theory link up best with the principle of complementarity, whereby the aim is to define tasks based on individual interests. In both cases two criteria for interactive decision making should be met: openness of contents (room for new ideas) and transparency of the process (roles and responsibilities). The number of actors involved (openness of the arena) may vary.

While acknowledging the advances made, I can see the following weaknesses:

- Addressing large-scale and long-term major environmental problems; most integral planning or communicative action approaches focus on relatively limited problem fields
- Situations with a multitude of interests and sectors involved would require bringing together relevant actors from different levels (local, supra-local) and different background (e.g. sectors); most approaches focus on a manageable set of actors and interests from one level or sector
- The risk of the approach becoming an end by itself, neglecting sustainability standards or progress in terms of sustainable development; discussions about means and ends are often confusing, and a range of different motives and goals interfere.\(^7\)

In the following section three development models are reviewed, showing variation in the planning process, for instance with respect to the use of system-analytical and process-analytical tools.

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\(^7\) As regards participatory methods a distinction has been made between those methods being used as a means (when goals are fixed and externally set, that is, when instrumental arguments prevail), and as an end by itself (to ‘empower’ participants so that they can form their own future, that is, when political or ideological arguments prevail) (Nelson and Wright, 1995). This distinction misses the major goal of more sustainable development, which is not an automatic consequence of more empowerment.
5.4 THREE DEVELOPMENT MODELS WITH CASE STUDIES

Three development models will be reviewed and analysed on their planning and design methods: participatory land-use planning (with ‘gestion de terroir’ as one example), co-management involving negotiation between two parties, and integrated environmental management involving all actors within a certain area. It will be concluded that these approaches all have reached some successes, but face difficulties to help find solutions for complex environmental problems.

5.4.1 THE EVOLUTION OF PLANNING AND DESIGN IN DEVELOPING COUNTRIES

Land-use planning and design methods have shown considerable change; Box 5.4 gives an overview of the evolution of land-use planning as can be considered typical for many developing countries.

Box 5.4: Different phases of land-use planning in developing countries.

1. **Pre-colonial period.** From this period little information is available. Contrary to general assumptions, spatial planning was not limited to village level, where the ‘chef de terroir’ and other traditional resource leaders (e.g. on water, hunting grounds) regulated resource-use, but included organisations and rules for management of natural resources at larger scales (e.g. for hunting in Benin).

2. **Early colonial period.** Here, spatial planning focused at finding the best places, schemes and means for European market oriented cash crop production mainly. In several cases excellent soil and vegetation surveys were carried out.

3. **Late colonial and early independence period.** Here, technology transfer was an additional element, based on Western norms. Top-down planning approaches and associated legislation prevailed, e.g. the establishment of state forests, protected areas and erosion control on agricultural fields, with interests for national economies at early independence.

4. **International aid period.** Here, one can observe the following evolution:
   a) **National economic development,** with a focus of planning on productive sectors for national economic development (e.g. food security, infrastructure, water security). A project typically deals with construction of a dam and an irrigation scheme.
   b) **Focus on community participation,** following the insight that indigenous management practices have their ecological and social rationale and local communities have the moral right to be actively involved, leading to a more participatory approach.
   c) **Focus on environmental issues,** following environmental awareness in donor countries, and awareness of the ecological aspects of drought, deforestation, energy crisis, etc. Projects typically deal with reforestation, soil and water conservation, grazing reserves, etc., and have a strong spatial zoning component.
   d) **Integration with socio-economic context,** following the insight that environmental management is not successful if not based on basic socio-economic needs. A more integrated rural development approach developed. Projects typically deal with development issues such as rural food security, agricultural extension, credit systems, education, etc.
   e) **Integration of institutional aspects,** following the insight that local development will not sustain if management institutions are not developed, at different levels. Projects typically pay attention to organisational change, human capacity building, management issues, marketing aspects, financial sustainability, etc.
   f) **Integration of political issues,** following the insight that existing power structures and political interests, at different levels, often obstruct necessary (institutional) change. Nowadays, this links up with policies of decentralisation and devolution towards local levels. Projects typically deal with capacity building and ownership, legal reforms, devolution of management responsibilities to local level, etc.
Linked to this evolution there has been a change of planning modes as regards the interaction between actors during the planning process as well as subsequent management phases. These modes are related to the historical phases of Box 5.4, and are described hereunder.

**Mode 1: Top-down (command and control), phases 3 and 4a**
The first response to apparent resource degradation has been top-down (command and control) approaches, first by colonial powers, later by national governments. In this mode, certain resource uses are declared illegal, and people are excluded from certain places (e.g. conservation areas). Local residents are regarded as adversaries to resource management and ‘protected’ areas. Except for relatively small areas with highly valuable resources (e.g. national parks) this approach has generally failed (Van den Breemer and Venema, 1999). Firstly because interest groups are not involved in any way. Secondly, many developing countries are now faced with economic stagnation, causing on the one hand the decline of state organisations, and on the other hand increasing pressures due to rural poverty. Under these circumstances the ‘top-down’ mode is particularly ineffective.

**Mode 2: Bottom-up (participatory, community-based), phases 4b to 4d**
The reaction was based on failures of the previous approach, its moral unacceptability, and on new insights about the role of local communities in resource management. It is argued that taking into account local values and indigenous knowledge can contribute positively to sustainable resource management. This has lead to a ‘participatory’, ‘bottom-up’ or ‘community-based’ approach whereby local residents are key actors. This mode is characterised by a certain amount of one-sided solidarity with local people. Many community-based initiatives originated from a political background of disempowerment and neglect of local responsibilities and traditions, having been overruled by colonial powers and illegitimate and non-accountable state powers. The state is now considered as external to the process, or only involved at certain stages, or in extreme cases is seen as an adversary not to be involved. The same attitude generally applies to the commercial sector (the private sector and entrepreneurs seen as exploiting local people).

In spite of considerable improvements in comparison to the previous mode, the participatory mode also has certain weaknesses:

- Local management systems are not always sustainable, or more sustainable than formal management systems, contrary to popular belief
- A mere bottom-up approach is not sufficient because external knowledge has to be transferred to local people (Breemer and Venema, 1999)
- Because it ignores intergenerational justice and environmental sustainability, community-based action has limited scope for sustainable development. The approach underestimates conflicts between resource users and the possible trade-off between livelihood security and environmental management, as well as between present and future needs (Véron, 2001).
- It appears that local institutions are not adjusting to accommodate population growth, consumption patterns, resource scarcities and fluctuating market conditions (Campbell et al., 2001)
- Local development plans made by stakeholders often neglect spatial and temporal externalities. To do so, these plans require coordination and strategic planning at supra-local levels (Véron, 2001).

**Mode 3: Collaborative (co-management, integrated), phases 4d to 4f**
Reflecting dissatisfaction with the above modes, another mode emerged whereby both local and supra-local interests and visions on natural resource management are considered legitimate and worthwhile. As roles in environmental management are shared, based on the recognition that each
actor or group of actors has a potentially positive role to play, I will characterise this mode as collaborative. It aims at an effective mix of inputs and knowledge, integrating suitable elements from top-down and bottom-up approaches, and involving multiple actors from civil, private and public sector. A multitude of different methods have emerged in recent years showing considerable variation, and often poorly defined. In the following I will refer to co-management as the situation whereby two actors (the state and local communities) agree upon mutual responsibilities in the enterprise of resource management. A related situation is one whereby multiple (more than two) actors are involved; this will be referred to as ‘integrated environmental management’.

I will now review three development models, as examples of modes 2 and 3 indicated above:
1. The participatory land-use planning model (mode 2), based on experiences with Gestion de Terroir in West Africa. Here a system-analytical approach with top-down features is linked to participatory and communication tools to involve communities.
2. The co-management model (mode 3). Here we find a negotiation approach involving two actors, the state and local communities, to agree upon tasks and responsibilities for natural resource management.
3. The integrated environmental management model (mode 3). Here we find a process-oriented approach that involves multiple actors in a local setting (platform, round table), to agree upon a common vision, strategy and actions to be taken.

In the following review of planning and design methods, particular attention is given to:
• Management of the planning process (participants, roles, ownership, facilitator, follow-up, etc.)
• Openness of the planning process (in terms of process, design substance and participants)
• The concrete environmental impacts (at different levels)

5.4.2 LOCAL LEVEL PARTICIPATORY LAND-USE PLANNING: GESTION DE TERROIR

One type of different participatory local level land-use planning model is Gestion de Terroir (GT), as applied in Francophone (Western) Africa. By GT the aim is to develop a management plan for natural resources within a given area, with allocation of land to certain uses, possibly including limited access and controlled use of certain resources at certain times and places. Looking at the evolution of land-use planning, the GT model originated in phase 4c (environmental focus following the Sahel drought) but is strongly rooted in phase 4b (community participation focus based on poor performance of the state). The GT model links up with the anti-desertification strategy with two main objectives of food security and environmental sustainability.

The GT approach is basically system-analytical, as it is organised in rational steps, from initiation and setting objectives, awareness raising and information, to a diagnostic, community organisation, planning and priority setting, establishment of a management committee, implementation and monitoring and evaluation (Blokland, 1989; Bognetteau-Verlinden et al., 1992; PNGT, 1993). The approach claims to subscribe to the following principles: voluntary community participation, inter-sectoral and inter-disciplinarity, decentralised and bottom-up planning, co-ordination and flexibility. In practice, a multi-disciplinary expert team involving external agents and community representatives implements the GT approach. The initiative is usually linked to a donor project so that funding of the

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8 For instance multi-party, round-table, mixed or joint resource management. Participatory approaches such as community-based natural resource management (CBNRM) are evolving in the same sense.
process and follow-up are more or less secured. However, in most cases funding is limited to certain sectors (e.g. water and sanitation, or forestry) in line with donor development priorities.

There has been debate about the scale of implementation. While there is a clear need for national and sub-national (regional) plans, in practice all resulting plans focused on village level. In most cases the territories of a few closely linked villages were taken as the planning unit.

In 1988 a planning method for implementing the GT model was tested in Burkina Faso. The diagnostic and design phase was based on the FAO land evaluation method (using aerial photographs and land utilisation types with sustainability criteria) and on existing community participation methods. The method was applied by a multi-disciplinary team of external agents and a village committee (Verlinden Bognetteau et al., 1992). Some of the conclusions were:

- The analysis of the existing situation showed that population pressure exceeded the estimated carrying capacity within the village territory. As the potential for agricultural intensification or alternative employment generation are limited, this would basically imply transmigration of part of the population. This was an unacceptable option. As a result it was difficult to propose a realistic and feasible development plan.

- The method was considered to be complex and time consuming, although there was scope for simplification. The test was funded by a project, including incentives for government officers to participate, and was strongly associated with donor (environmental) interests.

This test was not followed up. In following years the method evolved to a participatory approach with tools and methods focused at socio-economic community needs, while integrating environment oriented activities such as tree planting or anti-erosion structures where possible.

The GT approach has successfully raised awareness on environmental issues within development plans, introduced participatory approaches, and strengthened local institutions. Various participatory-communication tools were used (e.g. exchange visits are very effective). Some of the local institutions also engaged in partnerships with external support organisations, and got involved in policy dialogue (Toulmin, 1994; PNUD, 1997). However, there are some remaining weaknesses and associated challenges (based on Guèye, 2000):

1. There are often unrealistic expectations of participation as a panacea to solve problems, and as an end by itself. Participatory approaches are applied indiscriminately and sometimes without sufficient skills and capacities, or with unrealistic time frames. There is a strong dominance of outsider norms and views, problems of legitimate representation, and poor women’s participation.

2. Applications were mainly initiated by national NGOs, development projects and government agencies. There is need to decentralise these initiatives to local governments and local actors. But then these need capacity strengthening, devolved powers, organisational and management support.

3. While much attention is given to mechanisms such as participation and/or local organisational capacity building, there is limited insight on concrete impacts. There is little monitoring, e.g. on environmental improvements, poverty alleviation, equity aspects and real institutional change.

4. Much emphasis has been put on community based planning, but little attention has been given to stimulate private initiatives, to the economic feasibility of resulting plans and activities, and to the development of new products and markets.

5. Little real organisational change has been achieved, including capacity building and absorption of principles of participatory development by existing and legitimate local organisations.

Considerable socio-economic improvements were achieved, including environmental issues with direct relevance to socio-economic development. This has lead to certain environmental
improvements at local level. Also, relevant issues such as land tenure as an important underlying cause for poor environmental management are now high on the public agenda. However, environmental issues being addressed are limited to those of ‘sustainable use’, i.e. with direct linkages to the quality of products for local communities. Biodiversity issues and large-scale and long-term environmental issues are not adequately addressed. A consistent and long-term environmental strategy is so far lacking, at all levels, and the linkages between local plans and supra-local level policies are weak. There is need to scale up local level results and impacts, to manage ecological values and processes that operate at larger scales. There is a tendency for zoning to consolidate the existing situation (status quo), and not generate a vision and spatial image for a desirable future. This would include the integration of local perspectives into a regional or national context, e.g. the comparative advantages of the locality. Where existing pressures are (too) high, more sustainable options should be developed by looking at economic options within a broad spatial context and long-term perspective.

For scaling up there appears a need to integrate relevant issues at policy level, and to co-ordinate policies and interventions operating at different levels. This issue also raises the question of how participatory approaches can be applied on a wider scale, without losing genuine participation. There is potential to integrate higher level rationales (e.g. on resource use limitations) by linking up with decentralisation processes, if legitimate local governments are available.

There seem to be few successful applications of GT to pastoral land-use. The management of grazing lands remains a particular challenge, because here large land units are required and rigid zoning is not a viable option. Pastoral land-use in resource poor drylands is characterised by opportunistic and highly flexible and mobile management regimes and social systems. The GT model and its design methods should be adjusted to greater scale and mobile livelihood systems.

There is also a strong tendency for development efforts coming forward from a GT approach to focus at a relatively rich and favoured social layer within society, where win-win options can be identified, and to neglect marginal and poor layers of society (Gray and Kevane, 2001). Thus, the approach does not guarantee social equity.

5.4.3 CO-MANAGEMENT

The co-management approach has roots in the fisheries sector, and is now gaining momentum due to the dissatisfaction with and failures of both the top-down (state-based) and bottom-up (community-based) approaches. These are increasingly seen as based on the normatively and empirically false assumption that either the state or the local communities command the right to natural resources and the wisdom to manage them (see section 5.4.1). Co-management links up to a new paradigm of democratisation and decentralisation, involving an increase of authority of local councils and organisations. Most factors and actors that are external in the top-down or bottom-up approach, are internal in the co-management approach, and in principle open for discussion. Co-management is about creating linkages between local level and supra-local level interests (Uphoff, 1998). The focus is on developing management rights and responsibilities for both parties.

There are various definitions of co-management and related models (e.g. joint management, contractual management, co-production). These terms have in common that co-management is about a partnership between the state and those using the natural resource/s, with sharing of rights and responsibilities in the management of these resource/s. A proper definition of co-management would therefore be “the sharing of responsibility and authority between local communities and the government to manage (a) certain natural resource/s” (Persoon and Van Est, 1999).
The sharing of responsibilities refers to the various environmental management functions as indicated in Table 5.1. The ideal is that for each of these functions rights and responsibilities are co-managed by both parties. Depending upon the amount of responsibility and/or authority that the government and local resource users have, there are five different management styles, three of which can be referred to as co-management (Figure 5.7):

- **Consultative style**: the state consults local actors and their institutions but takes its own decisions
- **Cooperative style**: the state and local actors are partners, there are shared roles and responsibilities, leading to consensual decision-making
- **Advisory style**: the state advises local actors who then take their own decisions

Co-management originated in the fisheries sector. One example is from the Lofoten sea area in Norway. Here serious conflicts took place as a result of an increasing number of fishermen using the limited fisheries resources. The result was overfishing, following the principle of the ‘tragedy of the commons’. Starting from the early 19th century a number of decisions were taken that have lead to a co-management situation: management of the fishery grounds is devolved to fishermen groups, these groups set rules regarding fishery management and appoint inspectors to control whether the rules are respected, inspectors form a commission to set the rules and determine the quota for fishing.

Decisions are taken on the basis of democratic principles within the fishermen’s groups. The state maintains a certain controlling task, mainly by a law with rules on democratic decision making by the fishermen organisation. A slightly different system is applied for the flatfish sector in the Netherlands. Here the quota are set by the European Union, but fishermen are responsible to determine how to meet these quota in an effective and efficient way. For many other co-management arrangements in the fisheries sector in northern countries only implementation functions are shared, unlike functions of planning, policy making and monitoring (Sen and Nielsen, 1996).

The successes deal with one specific sector (fisheries), or sub-sector (flatfish). Important conditions for success of these co-management systems are trust and solidarity within the fishermen groups, democratic decision making procedures, and clear benefits for those participating. Also, the state must be willing to devolve some of its powers while local communities are internally well organised. Agreements are made with a limited number of groups, representing local level...
stakeholders, which makes the system manageable for the state, and transparent for stakeholders involved.

The co-management approach is now also being applied to terrestrial systems. Contrary to the sea, where fisheries is the predominant productive sector, in terrestrial systems multiple interest groups and sectors are involved. When limited to one sector, a co-management system may emerge. For instance, in India and Nepal forests are co-managed by village forest committees (which are elected bodies) and the forest Department. The forest Department’s main role is to keep away foreign woodcutters, but it may also be required to play a role in case of dispute between neighbouring villages (Skutch, 1996). However, it is unclear whether livestock owners and other forest users are well represented.

One well-known example of co-management in the wildlife sector is that of the CAMPFIRE programme in Zimbabwe (with similar experiences in Zambia, Tanzania and Namibia). The main two parties are local communities and the Department of national parks and wildlife management, generally represented within the District council. NGOs and donors contribute in terms of financial and technical support. Local people greatly benefit through incomes from wildlife trophy hunting, and in return they stopped poaching and undertake anti-poaching activities. However, management responsibilities for local communities are in most cases limited to wildlife management, and do not include decision making, quota setting or distribution of financial incomes. Communities cannot be considered as being the proprietors of the natural resources in their surroundings (Murphree, 1991). As a result, many villagers see the CAMPFIRE activities as having been imposed, and one can doubt whether the programme has lead to a change of attitudes (Olthof, 1995). Thus, for this example one cannot speak of co-management according to the definition I gave.

There have been attempts to expand the CAMPFIRE concept to management of forest resources but these have so far largely failed in Zimbabwe. Given the general optimism concerning potentials for joint forest management, Campbell et al. (2001) wonder whether the failure in Zimbabwe is an exception. They suggest that this optimism is based on isolated successes only, while their replicability is uncertain. The main reason why the model works for wildlife and not for forest resources, is the low productivity of woodlands and the low value of its products, which in relation to the high transaction costs of establishing and maintaining co-management makes the system unattractive. However, in situations with a high degree of forest dependence by local communities and severe scarcity of forest products, the value of these products is high and joint management will work (e.g. as observed in many Asian situations where population pressure is high and poor communities heavily depend upon scarce forest resources).

Van Kronenberg (2001) lists a number of conditions to be met for successful co-management. I will refer to these conditions as ‘success factors’, which implies that the presence of these conditions helps achieve success, but in most cases the absence does not necessarily lead to failure. The success factors should be a major concern during the co-management process. The following is a list of success factors for co-management:

For instance, where communication between participants is not optimal, this can be strengthened by undertaking a co-management process (in stead of waiting until such a condition has developed). Supporting a co-management process can be instrumental to help achieve social, institutional and political change.

Pomeroy et al. (2001) gives a list of 18 conditions for successful co-management in the fisheries sector. However, several of these factors are not mandatory but stimulating factors. Note that Van Kronenberg (2001) concludes that the type of property rights is not relevant for success of co-management.
1. Local communities have one voice, i.e. are educated and trained, are organised and well represented, and are willing to take up management responsibilities; there is a local government agency with clear rights and responsibilities
2. There are clear boundaries, with respect to the resource or area, the sector, the organisation and the socio-cultural groups involved
3. There are sufficient human, social and financial resources and knowledge inputs to support all co-management functions
4. There is a legitimate structure for local communities and the state to meet and negotiate, with everyone involved being able to take part or be represented on democratic grounds
5. The policy and legal context favours or does not obstruct co-management. Most importantly, there should be willingness for real devolution of management functions
6. There is a shared vision and positive expectations from the co-management arrangement, which requires that both parties perceive the existing situation as problematic (thus have a desire for change) and expect concrete economic benefits from co-management
7. There is embeddedness, i.e. trust and willingness to collaborate within both parties, and complementarity, i.e. defined and agreed-upon mutual responsibilities, formally or informally, orally or written, based on rational choice and individual interests and capacities.

There seem to be few formal planning and design methods applied in co-management arrangements. Most cases emphasise the proper management of a negotiation process. This suggests the importance of process-analytical tools and methods (Figure 5.6), including those for facilitating a negotiation process (Figure 5.5). However, a co-management process also includes detailed analytical studies, e.g. to set quota based on population studies, study legislation, assess risks, assess costs and benefits, determine efficient techniques, etc. Based on Breemer and Venema (2001) I identified the following steps of a co-management process:

- Analysis of stakeholders, their context, interests, institutions, problems and opportunities
- Establishment of communication channels and a negotiation structure – e.g. local platform or committee (usually established and facilitated by an external agency)
- Establishment of analyses and studies to acquire a reliable data base
- Recognition of stakeholder’s interests (by negotiation, joint analysis and activities)
- Facilitation of a negotiation process to agree upon a management arrangement.

Concerning these experiences with co-management, I have the following comments:
1. Where two parties are willing to start a co-management process, there is scope for improved mutual understanding, which implies that progress can be made. However, there is no guarantee that the shared vision and strategy and actions undertaken meet sustainability standards. In most situations the primary focus is on economic benefits, and therefore applying sustainable use principles. A critical issue is that of who sets the sustainability standards, and based on what criteria. Most experiences are local and do not take into account supralocal (e.g. global) interests and values. Thus, co-management does not automatically lead to sustainable outcomes, but the fact that different parties negotiate increases potentials for sustainable outcomes.

11 Decentralisation falls short, because co-management requires the role of the state to change from being directive and controlling to being facilitative, with enforcement as a critical but last resort.
12 For instance, with wildlife management schemes a critical issue is the hunting quota: who sets these quota, on the basis of what criteria, what would be arguments to change these quota, etc.?
2. Most successes are based on the commercial use of natural resources, such as the marketing of fish, timber, wildlife and tourism (Murphree, 2000). The success of the CAMPFIRE scheme is largely ascribed to the high value of wildlife resources (Campbell et al., 2001). For most other common property resources the value is lower, and transaction costs to establish and maintain a co-management system are higher. One possible solution would be to raise an ecotax.

3. Related to the above point, the focus on economic benefits constitutes a narrow basis for a change of attitudes. It is potentially counter-productive because economic benefits would become less (e.g. markets close down) the system collapses. There is no evidence indicating to what extent co-management success is based on the change of attitudes related to non-utilitarian values (Bell, 1987, cited in Olthof, 1995). There is also a risk of human greed leading to over-exploitation of resources for which good markets exist. More attention should be given to non-material benefits, and linkages to controls and norms based on traditions, cultures and belief systems.

4. There are still many co-management schemes that continue to depend on external funding, expertise, facilitation or organisational support. This might indicate that the interests of the two parties involved are not strong enough to sustain the approach.

5.4.4 INTEGRATED ENVIRONMENTAL MANAGEMENT

A variety of other approaches has evolved which do not fit into the co-management definition as indicated above. One major difference is the number of actors involved. While co-management deals with two parties, in most cases area-based planning involves numerous sectors and actors (Figure 5.8).

There are many approaches that aim to increase interaction between multiple actors, to share information and perspectives, foster mutual understanding, and stimulate collaboration to manage a certain area. Integrated environmental management (IEM) is one of several terms describing these area-based approaches to environmental and common-property management. IEM is based on the concept that environmental units, at any scale level, need to be managed in an integrated manner, i.e. through collaboration between different sectors and associated institutions (Margerum, 1999).

Strong interaction between various actors with direct or indirect interests in the ecosystem/s concerned (e.g. landowners, NGOs, local government, sectoral agencies, churches, etc.) will help build up trust and mutual understanding. The approach focuses on the communicative process, based on the assumption that through collaboration a diverse group of actors can improve environmental management. Ultimately, the groups involved should become self-reliant and independent from external support.

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13 For instance, in total some US$45 million has been spent on CAMPFIRE by donors (Campbell et al., 2001)
14 Similar terms include ecosystem management, integrated resources management, integrated catchment management, watershed and basin management, collaborative management.
I will now present two cases of the IEM model. Both of these cases are to my opinion erroneously referred to as co-management, given my definition. One is on regional planning in southern Mali (Joldersma et al., 1994; Hilhorst and Coulibaly, 2001). Village representatives negotiated with local government and other land-users on possibilities to regulate land-use in their region. This lead to approval of a local convention, with tasks spelt out for government services and for villagers. The key benefit for villagers was better protection of their resources against outsiders, which stimulated villagers to better regulate their own use. Constraints were conflicting national and local legislation and insufficient mutual trust and respect between the government and villagers. One could state that a co-management system might develop at a later stage following this exploratory phase.

The other case, at a larger scale, is on development planning in the Kerala state in southern India (Véron, 2001). Here, a top-down approach was followed by a more community-based approach, but it proved difficult to identify user groups with common productive interests and complementary assets. Also, the community-based approach did not improve environmental awareness and did not lead to environmental protection measures. The new model is that of synergy between local government and civil society. It aims to overcome class conflict and party politics by emphasising joint productive interests, and so attempts to build up broad alliances and mediating bodies of different interest groups. Planning is increasingly based on communication and negotiation, including entrepreneurs, government and civil society. To raise environmental awareness the new model involves environmental NGOs. The main role of the environmental NGOs has been, however, to offer environmentally-friendly technology for projects at local level. It is concluded that, although there are efforts to make use of synergies between civil society and the state at local level, the new model fails to enforce environmental policies at macro-level. Therefore the need remains for environmental planning, regulation and coordination at higher levels, to deal with spatial and temporal externalities. These and other efforts of IEM, both in the north and in the south, basically follow administrative boundaries (e.g. Districts or municipalities) in stead of ecological boundaries (e.g. ecoregions). For instance in Australia sustainable regional development (SRD) initiatives are evolving as a significant new component of Australia’s political and institutional landscape (Dore and Woodhill, 1999).
are two main reasons why these initiatives focus on the regional (sub-national) level (Rotmans, 1998; Dore and Woodhill, 1999):

- Regions are big enough to allow for effective strategic planning, social organisation and institutional development and co-ordination, and allow for some economies of scale
- Yet regions are small enough to be manageable, for local policy makers to be sufficiently informed, and for local actors to express themselves, feel part of what is going on, participate in decision making and have a sense of ownership.

During an IEM process, groups develop common understanding, learn to accept different perspectives, identify commonly accepted data and assumptions and agree upon common goals (Margerum, 1999). Most planning methods are of process-analytical nature. Regarding the final results, consensus is the norm, and this can be achieved through communication, negotiation, collective learning, etc. (Borrini-Feyerabend, 2001). Consensus is important for reaching an acceptable decision, but also for building long-term trust and support. However, concrete results can be disappointing. Hoefsloot and Van den Berg (1998) found that consensus for regional planning was achieved by zoning the area into different units to meet specific demands of different actors, according to a ‘spatial segregation model’, and no attempt to integration was made.

The following studies are compilations of experiences with integrated environmental management: Margerum (1999) on 23 integrated environmental management case studies from the US and Australia, Hoefsloot and Van den Berg (1998) on six cases of interactive regional planning, Dore and Woodhill (1999) and Campbell (1999) on experiences with sustainable regional development in Australia, and Breemer and Venema (2001) on several community-based and co-management case studies. I used these studies to identify the following success factors for an IEM process:

- Existing laws and policies should support an integrated approach, with policy objectives that allow for changes and inputs from the interactive process
- To be willing to participate in the collaborative effort, key actors must perceive potential benefits from improved collaboration, e.g. through possibilities to acquire access to resources or benefits, influence policy, solve environmental problems or social conflicts, etc.
- The group should also remain workable in size and complexity. ‘Relevance’ of actors relates to their formal position, control of relevant resources, power to hinder or block implementation, and stakes in the issue (see section 5.3.3.2). Both victims and responsible actors of environmental problems should be involved (or well represented).
- The role of the facilitator is critical. A good facilitator should be acceptable to all parties, have good communication skills and profound knowledge of the situation. While some state that a facilitator should be neutral, others state this is impossible.
- Ground rules, instruments and tools are required for open and transparent communication, for decision making, education, information dissemination, public consultation and conflict resolution. The whole process should be well documented and communicated.
- Conflicts should not be avoided but be openly discussed and tackled.
- During the process different sources of information should be taken into account: stakeholder opinions, (indigenous) knowledge, formal information and data, scientific insights, etc..
- A common complaint is that interactive planning processes take too long and the plan is too detailed. Therefore, as main outputs are proposed a vision, strategy and promising actions, and indicators for monitoring, feedback and adjustment during implementation.
- A comprehensive and integrated process should also be action oriented. Actions and ‘models for intervention’ must be implemented soon, with clear tasks assigned to actors. Short-term successes (or public events) are important for motivation and to gain political and public support.
Financial and technical support is required to trigger the process and to fund the activities. If not, participants will get frustrated. There is also need to develop financial support mechanisms that are sustainable, e.g. through taxes (where economic benefits are created) or trust funds (e.g. in resource poor environments or developing countries).

Apart from the above success factors there are conditions to successfully undertake an IEM process. I came across the following issues: full access to information, freedom and capacity to organise, freedom to express needs and concerns, a non-discriminatory social environment, absence of severe conflicts, confidence in the respect of agreements, relative cultural homogeneity, stable political climate, relatively well educated participants.

5.4.5. A TYPOLOGY OF METHODS

I will now present a typology to help decide which development mode to adopt and what planning methods to apply. The following two factors are a starting point for a typology (Table 5.5).

1. The perception of environmental problems or sustainability issues:
   a) The environmental problem is urgent, well-defined and generally acknowledged, but available solutions meet certain ideological, political, institutional or other constraints
   b) Environmental problems are not clear nor shared, but the need for change is perceived

2. The clarity of what needs to be done:
   a) Existence of relatively fixed / pre-defined goals\(^\text{15}^\) that are not generally considered to be valid, but which are already well-defined, so possible need to be redefined or adjusted
   b) Existence of relatively fixed / pre-defined goals that are generally considered to be valid, but need to be worked out and generate strong commitment
   c) Prevalence of political or ideological objectives, absence of clear goals, participants can determine their own future and define goals, i.e. the process is more open-ended.

<table>
<thead>
<tr>
<th>2. Clarity of what needs to be done</th>
<th>1. Urgency of (environmental) problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) To assess validity of pre-fixed goals</td>
<td>a) Urgent, well-defined</td>
</tr>
<tr>
<td>Environmental impact assessment, for well-defined intervention or problem</td>
<td>Strategic environmental assessment, for a sector or regional strategy</td>
</tr>
<tr>
<td>b) To work out valid pre-fixed goals</td>
<td>Co-management mode, emphasis at pro-active, sectoral, system-analytical, and focused tools and methods</td>
</tr>
<tr>
<td>c) To define a vision and goals</td>
<td>Usually integrated environmental management mode, depending upon the number of players involved</td>
</tr>
</tbody>
</table>

\(^{15}\) The word ‘goals’ can be substituted or broadened by policies, social or environmental standards, rules and regulations, strategic plans, etc.
To better understand how the two modes of co-management and integrated environmental management are related, let us assume eight parties with distinct interests in the (sustainable) management of a certain resource (sector) or involved in management of a certain area / region (Fig. 5.9). These involve actors from civil society, private and public sector, and from different levels (local, regional, national). They can come together to collaborate on issues concerning management of the region or sector as a whole, to build up and maintain mutual trust and transparency, and decide upon a vision, strategy, priority actions, management principles etc. However, there are no binding agreements what should be done by each party. On well-defined and urgent problems, key actors may form a coalition or a group, like different user groups at local level or related government agencies, so that two main parties remain (see Figure 5.9). These negotiate to agree on management tasks and responsibilities for a sector or resource, according to the co-management mode. Thus, out of a holistic orientation of an IEM, specific issues come forward that can be dealt with in a co-management setting.

The inverse is also possible. If two parties have agreed upon a co-management approach, for a well-defined and urgent management problem, it may become clear that their approach cannot disregard other sectors, issues or problems within the area. The need may arise to involve other key players, and see how the sectoral co-management approach fits into a large-scale and long-term development vision. Thus, other parties will be invited and an IEM mode emerges. Note that, as an integrated approach involves high transaction costs, where possible well-defined problems should be addressed through a more focused approach (Margerum, 1999).

Figure 5.9: The dynamics of a co-management and an integrated environmental management mode
5.5 CONCLUSIONS

I now draw conclusions from this chapter and establish linkages with previous chapters. There are four clusters of conclusions, constituting pre-cursors for my own framework in Chapter 7:

- Promising trends (to be strengthened and followed up)
- Remaining gaps (to be addressed and ‘solved’)
- Pitfalls (to be avoided)
- Challenges (as a starting point to work out and evaluate my own framework)

5.5.1 PROMISING TRENDS

1. Two types of integration for mainstreaming environmental issues

Mainstreaming environmental issues into development planning processes implies that ‘the environment’ is not treated as a separate sector but as a cross-cutting issue. For achieving this, integration is required in two respects:

1. **Substantive** (WHAT): defining bottom-lines for critical environmental and socio-economic aspects (location-specific standards and norms), dealing with these bottom-lines on an equal footing, identifying areas of overlap (win-win options) and trade-off, focusing on environmental opportunities, and systematically addressing institutional implications

2. **Procedural** (WHEN and HOW): from top-down, reactive and late in the planning process, to participatory, pro-active and early in the process (ideally, involvement in design of the process itself) (see Fig. 5.1). To improve participation and social learning during the planning process, there is need to use tools and methods that are integrative and inter-disciplinary.

Progress has been made in both respects but a real break-through has not occurred. This links up with conclusions on the difficulties for environmental management to change from traditional sector-oriented towards more strategic and ‘environmental governance’ oriented models (Chapter 4). To achieve real change, synergy between substantive and procedural aspects of integration is required.

2. Striking a balance between the substance and the process of planning

One can observe a shift of attention from the substance of planning to the process, from neo-classical step-by-step approaches to negotiation and communication methods and approaches. It is by now commonly acknowledged that planning should be part of an interactive learning process. I made a distinction between tools and methods from the system-analytical and change perspective (with a focus on the substance) and those from the process-analytical and learning perspective (see Fig. 5.6). For most planning models used in practice a system-analytical framework and associated tools still forms the backbone. *More attention for process-analytical tools will help build up mutual trust, learning communities and resilient institutions (to cope with complex systems and uncertainties).* It constitutes one element of a new way of looking at decision-making and planning, away from simulation and prediction, towards more heuristic exploration and learning processes (Ravetz, 1998). Striking this balance may serve purposes of emergency action, conflict management and collaborative learning, for which current neo-classical planning tools are not suitable (Sexton et al., 1999).

3. Conditions to be fulfilled for successful planning processes

When reviewing relevant planning experiences, one meets a range of different goals, objectives, conditions, principles and success factors. Most important is to identify pre-conditions for successful planning. Pre-conditions are difficult to define if the planning process is a central part of an
institutional development or policy making process (e.g. at decentralised level). For instance, mutual
trust or communication channels can be stimulated by an interactive planning process. Likewise, good
governance is often considered a pre-condition for environmental management, but one can also
reason the other way round (e.g. Bina, 2002):

> undertaking an integrated planning or sustainability
assessment process can help identify and improve on fundamental institutional and governance
issues\(^\text{16}\).

A preliminary list of pre-conditions to be fulfilled for sound environmental planning would be as
follows: equal access to information, freedom and capacity to organise, freedom to express needs and
concerns, a non-discriminatory social environment, absence of severe conflicts, mutual trust and a
sufficient confidence in the respect of agreements, relative cultural homogeneity, sufficiently stable
political climate, relatively well educated participants.

4. A structured set of goals and success principles for a good planning processes

Apart from pre-conditions, there is need for objectives and principles to guide environmental planning
processes (Thissen, 2000). Goals, principles and criteria\(^\text{17}\) can be used to provide guidance to a
planning process. I propose the following two categories:

1. Concrete targets or goals. These will help orient activities and evaluate progress in terms of
congruent impacts and the (quality of the) planning process.
2. Success principles or criteria. These are aspects to focus upon before and during the planning
process. Doing that will increase chances of reaching the set targets.

Targets and success principles should be defined for both the substantive aspects of a planning process
(e.g. concrete plans, policies) and for the social learning aspects (e.g. what people involved learn,
undertake, network, collaborate, understand). This leads to a set of targets and success principles for
these two aspects of planning processes (Table 5.6). Note that more specific success factors can now
be defined based on these general success principles; as was done for the co-management and
integrated environmental management methods (section 5.4).

---

\(^{16}\) In the Netherlands, democratic governance systems have developed on the basis of the need to have highly
accountable water management institutions, as any mismanagement could lead to dramatic floods.

\(^{17}\) Conceptually speaking, goals, principles and criteria are linked as follows. A goal is an overall objective to be
achieved (e.g. sustainable forest use). A principle is a fundamental law or rule serving as basis for reasoning or action, an
explicit element of a goal (e.g. forest regulation functions shall be maintained). A criterion is a state or aspect that should
be in place to comply to a principle (e.g. slopes steeper than x\% are not cleared). Principles and criteria could be translated
into practical guidelines (Tropenbos, 1997).
Table 5.6: A structured set of targets and success principles for a planning process

<table>
<thead>
<tr>
<th>Substantive aspects</th>
<th>Success principles / criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A long-term vision and strategy</td>
<td>• Functional participation (vertical and horizontal)</td>
</tr>
<tr>
<td>• Environmental and socio-economic (sustainability) norms or standards</td>
<td>• Holistic, integrative</td>
</tr>
<tr>
<td>• Problem definition and explanation</td>
<td>• Focused</td>
</tr>
<tr>
<td>• Monitoring indicators and system</td>
<td>• Action-oriented</td>
</tr>
<tr>
<td>• Starting activities, opportunities</td>
<td>• Widely accessible and understandable</td>
</tr>
<tr>
<td>• Organisational plan</td>
<td>• Contextualised in long-term and large-scale</td>
</tr>
<tr>
<td>• Information and data base</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social learning / process aspects</th>
<th>Success principles / criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Respect of mutual views and vision</td>
<td>• Multi-disciplinarity, multi-sectoral</td>
</tr>
<tr>
<td>• Consensus or ‘agreement to disagree’</td>
<td>• Interactive</td>
</tr>
<tr>
<td>• Social and communication networks</td>
<td>• Transparent, accountable</td>
</tr>
<tr>
<td>• Sense of ownership and commitment</td>
<td>• Creative</td>
</tr>
<tr>
<td>• Organisational arrangements, platforms</td>
<td>• Negotiated</td>
</tr>
<tr>
<td>• Mutual trust and respect</td>
<td>• Continuous, iterative, cyclical</td>
</tr>
<tr>
<td>• Conflict resolution</td>
<td>• Early in decision-making process</td>
</tr>
</tbody>
</table>

5. From top-down or bottom-up planning to collaborative modes and methods

Among modes that bring together requirements for good planning and design, collaborative management is now gaining momentum due to the dissatisfaction with and failures of both the top-down (state-based) and bottom-up (community-based) modes. These modes are increasingly seen as based on the normatively and empirically false assumption that either the state or the local communities command the right to natural resources and the wisdom to manage them. I discussed two promising models of collaborative management. Co-management *senso stricto* whereby the state and communities (civil society) negotiate to agree upon shared responsibilities for a range of resource management functions. Integrated environmental management whereby more than two actors, in fact all important actors with certain interests in the management of a certain region or resource, are involved to agree upon a common vision, strategy or management plan and their roles and responsibilities (without necessarily sharing these).

Table 5.7 lists some differences between these two models. In section 5.4.5 I described how these two models can be used in synergy. Improvisation and flexibility in the use of both process-analytical and system-analytical methods is an important characteristic of these new planning models, contrary to top-down or bottom-up planning (Van den Breemer and Venema, 2001).
### Table 5.7: A comparison of co-management and integrated environmental management models

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Co-management</th>
<th>Integrated environmental management (IEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus</strong></td>
<td>Usually one sector</td>
<td>Usually multiple users and sectors involved</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Two main parties, possibly representing a more broad group of actors, including the state and local communities</td>
<td>Multiple actors / interests groups / stakeholders, usually involving private sector, government and civil society</td>
</tr>
<tr>
<td><strong>Starting point</strong></td>
<td>A common problem perception and vision on a desirable development, perception that by co-management progress can be made, mutual trust and personal ties exist (embeddedness) as a basis for well-defined environmental management roles</td>
<td>Variable, a common problem or opportunity (e.g. decentralised planning), a common vision generally does not yet exist, embeddedness not necessary, more open-ended process</td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td>Concrete institutional arrangements and management plan, agreement on shared responsibilities for both parties for all management functions</td>
<td>Improved understanding and insights, consensus on a vision, strategy and/or some joint actions, synergy by coordination, some shared responsibilities</td>
</tr>
<tr>
<td><strong>Design methods</strong></td>
<td>Both system-analytical and process-analytical methods</td>
<td>Predominance of process-analytical methods</td>
</tr>
</tbody>
</table>

6. **The critical role of the process facilitator**

The review demonstrated the critical importance of a good process facilitator for application of interactive planning methods. A facilitator may have different tasks:

- **Expert:** bringing in expertise on interactive planning methods, supporting the process, stimulating exchange of experiences, being an actor among the actors
- **Change leader:** stimulating the participants, leading meetings and discussions, forging agreements, mediating in case of conflicts
- **Manager:** assuring that goals are reached, principles are respected, time limits and budgets are not exceeded, decision-makers are well informed
- **Spokesman of absent stakeholders:** assuring that interests of absent stakeholders are considered (future generations, outside communities, nature values)
- **Normative observer:** helping set and respect sustainability standards and norms (environmental, good governance, social equity)
- **Lobbyist:** building bridges between parties, informing policy makers and other actors causing environmental problems, communicating with adverse parties.

While in some cases these tasks require a ‘neutral’ role, in other cases a ‘normative’ or ‘watchdog’ role is required. These different functions cannot easily be found within one person or organisation, and tasks may be delegated (e.g. to an environmental NGO).
5.5.2 REMAINING GAPS TO BE ADDRESSED

1. The need to set sustainability standards

Although the focus on environmental management as a process (of social learning and institutional development) has many advantages, there is a tendency to consider the process as an end in itself. As a consequence, the evaluation of ‘success’ of participatory planning tends to focus on the process and not on concrete (environmental) impacts\textsuperscript{18}. But one should not forget that any planning method is a means rather than an end (Margerum, 1999). The concrete goals and targets identified must undergo the same critical examination applied to any other management effort. This shows that environmental assessment and monitoring remain necessary, even if the planning process has met all success criteria.

There is often agreement on the need to define social and economic standards (e.g. for income, social services, equity, gender participation, etc.). However, there is also a tendency to disregard any objective limitations to the capacity of the environment to provide goods and services, and to consider any such limitations as being socially constructed and therefore subject to power relations and (political) interests. A desirable outcome would then be one which is agreed upon, as a result of a democratic process. This opinion undermines the need to set standards for environmental sustainability (section 2.3). These are commonly neglected in the light of short-term interests\textsuperscript{19}.

To agree on the need to define environmental (and social) bottom-line standards it is required that:

- Environmentalists accept that standards are only defined for priority environmental issues based on objective criteria (e.g. ethics and thresholds of irreversible change), and accept that for other (less important) environmental issues negotiation is possible;
- Socio-economists accept that certain environmental services have basic economic and cultural values for long-term and large-scale survival of human mankind.

2. The need to define who sets and who enforces the standards and norms

Having agreed on the necessity to set sustainability standards and norms, two questions arise:

- How and by whom will environmental (and social) standards be established?
- How and by whom will the standards be controlled? (including compensation measures if environmental standards conflict with social or economic standards).

Experiences with interactive planning show that environmental aspects with short-term effects and interests will be adequately dealt with if the real interest groups are directly involved in decision-making. But participation and interaction is not a guarantee to consider long-term and large-scale environmental (nor social) sustainability aspects, including spatial trade-off (impacts in other areas), temporal trade-offs (for future generations) and biodiversity impacts (without clear consequences for human populations). Campbell (1997) sees a role for the process facilitator who is also ‘the voice of the catchment’, speaking explicitly in the public good interests of sustainable use, while accepting that actors will primarily act in their own short-term interests. Véron (2001) emphasises the role of environmental NGOs, but concludes that these tend to overlook the environmental issues at macro-

\textsuperscript{18} For integrated environmental management, Margerum (1999) based success on concrete outputs (plans, products, policies) and intangible outcomes (trust, networks, partnerships), but did not consider physical or development impacts. Hoefsloot and Van den Berg (1998) defined success as the majority of actors involved being satisfied. Dore and Woodhill (1999) defined a range of process principles for a successful regional development process. One reason for not considering concrete impacts is the insufficiency of available data.

\textsuperscript{19} For instance, the failure to develop norms and standards at a higher level of aggregation than the local level has been mentioned as a weakness of social learning for sustainable agricultural (Woodhill and Röling, 1998).
level, and therefore emphasises the role of environmental planning and regulation at state level. This brings us back, not to the top-down approach, but to the shared roles of setting standards and controlling these by environmental NGOs and environmental government agencies, as part of an interactive co-management process.

3. The need to pay more attention to non-utilitarian environmental values
Environmental sustainability is most commonly interpreted as ‘sustainable use’, i.e. with direct linkages to the economic value of products for stakeholders. Successful experiences with resource management involving local communities are usually based on the commercial use of high value natural resources, such as fish, timber or wildlife. There is no evidence indicating whether these successes are based on a change of attitudes beyond direct environmental values. Thus, there is a risk of human greed leading to over-exploitation of resources for which good markets exist (or have been created), or of sustainable management systems degrading if markets collapse. Problems of social equity (some benefiting, most not) are directly related to this bias.

For many common property resources the economic value is low, and transaction costs to establish and maintain a co-management system are often high. This may partly explain why for common property resources with low economic values the co-management model has so far not been very successful. This conclusion also suggests that so far conservation successes with local people have been achieved for situations and resources that are not very representative (Campbell et al., 2001).

I think that the economic bias will sooner or later appear to be a ‘dead end’. More attention should be given to non-material, non-rational and emotional values, and controls and norms based on traditions, cultures and belief systems. This links up with the broad view of ‘the environment’ including cultural human values and intrinsic values of nature (Chapter 2.2). Understanding and defining these for each situation should be part of the planning process.

4. Addressing the link between NEAP and LEAP (national - local environmental action plans)
In most countries by now national environmental action plans (or similar policies, strategies or plans) have been developed. These plans do address public environmental goods (such as water resources, climate change, biodiversity conservation, etc.) but the plans have been poorly implemented at local levels (Dalal Clayton and Bass, 2002). On the other hand, there are by now many successful cases at local levels, e.g. through participatory or community-based models. There is need to scale up local level successes, to address environmental services and ecological processes that operate at larger scales, to develop more sustainable development options within a wider spatial and temporal perspective. As national environmental action plans are worked out at decentralised level, national or global environmental issues are usually not considered a priority.

A regional approach can be important for resource-poor environments, such as savannas, of which the dynamics and land-use systems operate at relatively large scale. For instance, the management of semi-arid grazing lands remains a particular challenge, because here large land units are required and rigid zoning is not a viable option. Here pastoral land-use is characterised by opportunistic and highly flexible and mobile management regimes and social systems. Existing planning models do not adequately deal with these issues.
5.5.3 PITFALLS TO BE AVOIDED

1. Making uncritical extrapolations and disregarding the local context
There is a tendency to make uncritical extrapolations of successful experiences, leading to applications of a standard method for situations which they are not meant for. This is referred to as the misuse of methods, in a rather indiscriminate, mechanistic, ritualistic and/or routine-like fashion (Leeuwis and Remmers, 1999). Frameworks, steps, guidelines or tasks are useful to support users, but should not be used as rigid recipes (even if in practice this may be what users ask for). Every application will need to pay equal attention to the local context, including spatial issues, historical trends, institutional issues, temporal scale, traditions and norms, social dynamics, etc. (see Chapter 3). This requires time and expertise. In most cases no short-cuts can be made.

2. Disregarding the bottom-line standards and norms
Given the complex relations between environment and development, there is a tendency to develop an ever increasing range of conditions, principles and criteria that should be met for successful planning processes. Table 5.5 is an attempt to structure these various requirements. Yet, it is impossible to meet all these requirements, and most applicants will focus on one or a few of these principles only. Leeuwis and Remmers (1999) found that none of the applications of integral design are fully interactive, multi-functional and multi-disciplinary, but rather focus on one of these issues.

This limitation might be justified as one cannot do everything right at once and learning also involves making mistakes, and learning from mistakes is in fact a pre-condition for success (Senge, 1993). However, some mistakes are unacceptable, because of their irreversible effects (irreversible environmental or social damage), and should be avoided in any case.

3. Operational planning without a vision or strategy
Most neo-classical planning methods aim to develop detailed operational plans. A strategic plan providing the long-term scope for operational plans is often not available or well documented. New approaches such as integrated environmental management aim to develop a vision and strategy before coming to operational plans. This is particularly important to address large-scale and long-term sustainability issues (see Chapter 4), but should subsequently be worked out in operational terms.

Planners and decision-makers often focus on one sector and define concrete actions before the larger picture is clear. Their priority is to solve urgent problems and show early successes. Even when a vision and strategy is available, and agreed upon, there often is a tendency to go for short term successes, even if these do not fit in the vision. Assessing at regular intervals the harmony with the vision and strategy may be helpful to avoid this.

It should also be kept in mind that different mindsets (and personalities) are involved: while designing a vision and strategy is basically a qualitative, holistic and inductive process, operational planning is quantitative, detailed and deductive.

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20 For instance, planning and design methods should be part of a process which is continuous, flexible, participatory, pro-active, interactive, integrative, multi-disciplinary, multi-sectoral, innovative, adaptive, creative, intuitive, action-oriented, strategic, etc.
4. Dealing with resistance to interactive planning

Although the need for participatory and interactive planning is generally accepted, the claims to do so are not yet made true. This may be related to the pre-conditions that are not met. There appears to be need for awareness raising, education, capacity building and institutional reform to support interactive planning and design processes. These need to address the following constraints:

1. **Moral belief systems of society**: natural resources are plentiful (no limitations in their use), great confidence in technology to overcome problems, implicit desire for continuous economic growth.

2. **Management traditions**: dominance of rationality, economic value systems, static goals, project-based and output-oriented planning and management styles.

3. **Institutional rigidity and inefficiency**: compartmentalised organisations, existence of secondary goals, poor collaboration and conflicting policies, donor driven and project-based culture in developing countries.

4. **Organisational weaknesses**: poor internal and external (one-way) communication, disciplinary functions within organisations, mechanistic and deductive thinking, lack of learning culture.

5.5.4 THE CHALLENGES THAT LIE AHEAD

Rounding up the material from this chapter, I can now specify that the planning framework and approach that I wish to develop must meet the following criteria:

- Environmental sustainability aspects dealt with in a positive rather than defensive / reactive way, based on their current and potential values for society, and clearly leading to respect of or agreement on bottom-line standards and norms for environmental sustainability;

- Aimed at developing a long-term and large-scale plan (a vision, a strategy) which is integrated in terms of environment-development relations (macro-level analysis: Chapter 3);

- Leading to firm agreements, partnerships and concrete actions, for instance based on a co-management approach and opportunities for early successes;

- Manageable, not too time-consuming and complicated, while not making unacceptable short-cuts and extrapolations, i.e. focused at key issues based on a good insights (Chapter 3);

- Based on a typology to make broad choices of which planning model and approach is appropriate, using both integrated environmental management and co-management models (section 5.4.5);

- Using in a flexible way tools and methods from both system-analytical & change and process-analytical & learning perspectives, to put in practice environmental governance and management (Chapter 4).

There is also a call for more empirical evidence, concrete cases with monitoring of impacts of planning and design approaches, based on well-defined criteria for success. This is why in the next Chapter 7 I will review in detail my own concrete experiences with Strategic Environmental Analysis (SEAN).

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21 For instance, in the Netherlands agricultural policies claim to be innovative and participatory since the early 1990’s, but there are strong doubts about the realisation of these intentions (Roep, 2000).
6. EXPERIENCES WITH STRATEGIC ENVIRONMENTAL ANALYSIS

In the previous chapter I reviewed planning and design methods and approaches developed by others. In this chapter, I will review my own experiences with environmental and land-use design and planning. These experiences date from the early 1990s onwards, when I got involved in the making of environmental profiles and environmental assessments of rural development projects in developing countries. The focus of this chapter is on the experiences gained with an environmental analysis and strategic planning method called Strategic Environmental Analysis (SEAN), which I developed myself. With some other experiences presented in this chapter and the insights from previous chapters, these will form all the ‘building blocks’ for the design framework that will be presented in Chapter 7.

Section 6.1. Strategic Environmental Analysis (SEAN)
This section deals with the structure and elements of SEAN, which was developed to help design strategic plans with integration of environmental sustainability issues. SEAN is basically a participatory design process during which a number of analytical tasks are executed to unravel the complexity of interactions between society and the environment. The environmental dimension is the starting point and backbone of this method, and the main objective of using SEAN is to mainstream environmental sustainability into design and strategic planning processes.

Section 6.2. SEAN in practice
Examples of practical experiences with SEAN for environmental analysis and design in a number of developing countries will be presented, highlighting the main elements of the process and the results.

Section 6.3. Review of SEAN experiences
The experiences with application of SEAN will be reviewed and conclusions will be drawn on the strengths and weaknesses of the method.

Section 6.4. Experiences with the Action Network (AN)
The experiences with the AN projects (financed and undertaken by WWF) are interesting because the AN approach that was undertaken is in many respects quite the opposite of the SEAN approach. While the SEAN approach emphasises analysis, the AN approach puts most emphasis at early actions. Merging the best elements of both may create synergy.

Section 6.5. Conclusions
6.1 STRATEGIC ENVIRONMENTAL ANALYSIS

6.1.1 ORIGINS

In 1995, the Netherlands Development Organisation (SNV) requested AIDEnvironment to develop a methodology that would allow integration of environmental concerns into development policies and strategies in order to put into practice environmental sustainability objectives. Particularly in regions with limited economic potential, the use of natural resources in the immediate surroundings is the major activity to meet socio-economic development goals (e.g. Morvaridi, 1997). Thus there is need for systematic environmental analysis to answer such questions as:

- What are the insights and interests of different stakeholders regarding proper environmental management?
- What social norms and environmental thresholds are involved in defining environmental problems? What is the problem perception by different actors? Whose problem is it?
- What are structural causes of environmental problems and how to tackle these?
- What are promising opportunities and initiatives to improve both the economic and environmental situation? What innovators and partners are involved? How may coalitions be formed to tackle complex problems and expand promising initiatives?
- How may environmental priorities be integrated with economic, social and gender priorities? What are priority long term development goals that meet sustainability criteria?

These questions may be addressed during environmental assessments of projects and programmes (see section 5.1). However, in order to achieve fundamental change of policies and strategic plans, a more proactive approach is required. This brings us to strategic planning, whereby in early planning stages, root causes and key actors of environmental problems (of institutional, political and socio-economic nature) can be identified, as well as existing opportunities, to identify win-win options, strategic partners and set sustainability goals. The analysis can focus on the interrelations between environmental concerns and socio-economic development (e.g. poverty alleviation).

In many places the absence of a clear long-term strategy has led to confusion, lack of coordination and the setting of incorrect development priorities. There is need for integrated (holistic, multi-sectoral) strategic planning, to give direction to development efforts and make these more effective (Sterkenburg and Van der Wiel, 1999; Farrington et al., 1999).

Strategic environmental analysis (SEAN) was developed as a strategic analysis and planning method, addressing the following challenges:

- Rigorous, by setting environmental standards for environmental sustainability;
- Integrative and holistic, by focusing on the interface between environment and development;
- Pro-active, by being applied during early stages of decision making;
- Supportive to strategic planning, by being linked to decision- and policy making processes;
- Practical, light and flexible and aimed at defining concrete outputs for policy makers;
- Participatory, involving relevant stakeholders in the entire planning process.

6.1.2 OBJECTIVES AND CONCEPTUAL BACKGROUND

SEAN can be defined as a participatory process to analyse the environmental problems and opportunities for human development, to identify the main actors involved, and to define a long-term vision and strategic goals at early stages of planning and decision making. The SEAN method is scale independent, and has been applied for different objectives (see for experiences section 6.2).
SEAN has the **long-term objective** to mainstream environmental issues into development planning processes by raising the level of knowledge on the environmental context and its relevance for sustainable development. **Short-term objectives are:**

- In terms of substance: To analyse the environmental context of human development for an area, its potentials and constraints, and to design a vision and strategic orientations.
- In terms of process: To initiate and support an interactive process with relevant stakeholders and actors, generating insights and commitment to undertake actions and sustain the process.

The analytical framework of SEAN is rooted in several concepts introduced in previous chapters.

1. **Sustainable development.** The main long-term target of SEAN is to secure an acceptable level of environmental quality, as one of the pillars of sustainable development. Although SEAN takes the environmental dimension as a starting point, priorities are set, opportunities and problems are defined, etc., on the basis of relevance for human development (section 2.3).
2. **Environmental sustainability.** Recognising the various environmental functions for multiple stakeholders is necessary to specify the importance of the environment for society. This includes environmental values for future generations (section 2.1). Recognising norms and thresholds for acceptable environmental change to ensure resilience of ecosystems and human livelihoods that depend upon these is an essential element (section 2.2).
3. **Problem in Context.** Central is the understanding of the social causality of environmental problems, and the identification of the actors involved, their options and motivations, their interrelations, their intentionality and perceptions (section 2.4).
4. **Adaptive management.** The aim of SEAN is to identify a vision and strategy, as a fundament for detailed planning and learning, in line with adaptive management principles (section 2.5).
5. **Opportunities and initiatives as strategic building blocks.** Existing opportunities for change and promising initiatives at various levels form the basis for identifying strategic options (chapter 3). Strategic partnerships with key actors are important opportunities and elements of the strategy.
6. **Micro–meso-macro linkages.** Problems, threats, root causes and opportunities (levers and potentials) of the local situation, as well as the long-term and large-scale contextual changes and the factors involved, form the basis for making strategic choices (chapter 3).

Methodologically, the combination of two approaches increases the efficiency of the SEAN process:

- **A systems approach** to gain detailed insight on critical issues (key problems, opportunities, actors, win-win options, institutions);
- **An approach of progressive contextualisation** to unravel the key factors and actors related to a certain problem, event or opportunity (see section 2.4).

Within SEAN, use is made of well-known methods such as:

- Environmental assessment methods (SEA, environmental profiles) –section 5.1
- Participatory land-use planning approaches (e.g. Gestion de Terroir) –section 5.3
- Integrated environmental management and co-management –section 5.3.

The SEAN process aims to be participatory and transparent. One could speak of horizontal and vertical integration of participants, by involvement of insiders and outsiders and actors from different institutional levels, by using local (traditional / indigenous) and scientific knowledge, formal and informal information sources. Particular attention is given to so-called ‘absent stakeholder’ groups, including future generations, outside communities and critical nature values. These should be represented by environmentally or socially oriented organisations (section 2.4).
6.1.3 THE SEAN ANALYTICAL FRAMEWORK

To structure the analysis and design process, an analytical framework was developed, consisting of 10 analytical tasks (Figure 6.1). The analytical framework provides a logical structure to assure that relevant environmental issues are not overlooked and are integrated with sustainable development dimensions (for more details see section 6.2):

- Tasks 1 to 4 focus at the analysis of the local and wider contextual interface between society and the environment.
- Tasks 5 and 6 focus at the identification and analysis of environmental problems.
- Tasks 7 and 8 focus at the existing opportunities (both operational and structural ones).
- Tasks 9 and 10 focus at the design of a vision and strategic orientations.

![Diagram of the SEAN analytical framework](image-url)
Chapter 6 – Experiences with Strategic Environmental Analysis

The SEAN process, whereby participants apply the 10 analytical tasks, is structured by 5 phases which can be summarised as: preparation, scoping, detailed studies, synthesis & planning, follow-up & monitoring (Figure 6.2). During these phases, the above-mentioned tasks are applied in different ways: training/learning, scoping, field assessments, planning and design, and monitoring. During phase 1, for instance, a local team is trained on SEAN tasks 1 to 10. Then in phase 2 steps 1 to 8 are applied in a scoping way based on existing knowledge. On average, the whole SEAN process may take about 6 months, including a range of workshops, thematic studies, interviews and public consultations.

6.1.4 THE INTEGRATIVE CHARACTER OF SEAN

The SEAN method is integrative in three ways (see also section 6.5).

In terms of substantive integration, SEAN takes the environmental dimension as a starting point in order to assure that environmental aspects are properly analysed and integrated in the planning process. However, this does not mean that environmental issues are necessarily more important than others. The critical question is that of the importance (weight) of environmental sustainability issues as compared to the other dimensions, and whether in case of conflicting interest integration is sought (as a form of consensus) or a choice is made. This refers to the need to have sustainability standards and norms (see section 2.4). The level of integration depends upon whether other analyses have been or are carried out alongside the SEAN process, and whether other methods and tools provide ‘linkages’ to other dimensions (Figure 6.3). The strategy has an integrated (sustainable development) or environmental character.

In terms of procedural integration, the aim is to integrate environmental considerations as early as possibly in design processes (similar to spatial planning), and to outputs that are useful for decision-makers: guidelines, criteria and standards for environmental management, strategic goals and priorities, potential partners, opportunities and win-win options, defined tasks and functions for institutions, etc..

In terms of methodological integration, variable use is made of tools and methods from a system-analytical and a process-analytical perspective (see Figure 5.6). Process-analytical tools will help generate strong and broadly based ownership of the SEAN results. Planners, decision-makers and stakeholders are involved at different moments in the process.
6.1.5 THE STRATEGIC CHARACTER OF SEAN

The aim of the SEAN method is to help define a vision and strategic plan. At this level long-term and large scale sustainability issues can be addressed. The vision and strategic plan provide direction and contours for concrete actions to be identified ‘along the way’, as part of a ‘learning-by-doing’ approach, with new insights and monitoring results as inputs to detailed planning. The strategy may also emerge during the decision-making process (see Chapter 4.3.4). The desirable structure of the strategic plan is presented in Figure 6.4, with an example in Box. 6.1. It includes:

- Current situation: insight in the current situation and its context, the qualities, trends, expectations, causing factors, opportunities, interrelations, actors and institutions involved
- Vision: a powerful image of a desirable future situation that gives direction and motivation
- Strategic orientations: paths to bridge the gap between the current situation and the desirable future, characterised by targets, actions based on opportunities and indicators. A strategic orientation can be set in action any time.
- Operational principles: this will include social and environmental principles or bottom-line standards to be respected during application of the strategy
- Institutional development orientations: organisational and institutional requirements to realise the strategy, by implementing organisation. A good monitoring plan and learning mechanism.
Box 6.1: Basic elements of the strategy resulting from SEAN application, as worked out for the National Conservation Department in Bhutan

The main components of NCD’s strategy were elaborated as follows:

- **Current situation**: values, trends, threats, opportunities, institutional setting, legislation, strengths and weaknesses, partners, current programmes

- **Vision** (“Maintain ecological integrity embedded in a social, economic and cultural environment mainly through management of coherent and viable nature conservation areas”), with explanatory elements, related mission statement and long-term objectives

- **Operational principles**: Participation and multidisciplinarity, Adaptive management including monitoring, Integrating conservation and development, Recognising conflicting interests, Magnification / scaling up, Non-negotiable principles, Sustainability

- **Strategic orientations**: Management of protected areas, buffer zones and biological corridors, Zonation of protected areas, Control of human / wildlife conflicts, Control of poaching, Integrated conservation development projects, Conservation oriented community based enterprise development, Management of historical and cultural sites, Environmental education, Research, survey and monitoring (all with introduction, targets, activities and indicators)

- **Institutional development orientations**: Organisational structure, Core competencies, Knowledge and data management, Internal communication and planning, External communication, Human resources development, Infrastructure development, Monitoring and evaluation (all with introduction, targets, activities and indicators).
6.2 SEAN IN PRACTICE

6.2.1 OVERVIEW OF EXPERIENCES

By mid 2002 the SEAN method has been applied numerous times in several developing countries. Most common has been the application for supporting the formulation of an integrated development strategy at regional or local level, in developing countries, e.g. Cameroon, Zimbabwe, Ghana, Benin, Honduras and Nicaragua. The applications show much flexibility, which is a strength of the method.

In terms of scale:
- At national level: formulation of a sustainable development strategy for Benin
- At regional level: formulation of sustainable development strategy for Atacora (Benin)
- At local level: municipality plans in Honduras (see SNV, 2001)

In terms of objectives:
- Formulation of an integrated development strategy for a certain area: see above
- Formulation of a sectoral strategy: wetland strategy in Benin
- Formulation of an organisational strategy: SNV in Cameroon

In terms of the owner of the process:
- Government agencies: national or decentralised government agencies
- Non-governmental organisation: strategy on sustainable development by environmental NGOs in Botswana (see: www.envngo.co.bw)

In terms of time required:
- Rapid applications taking only one workshop of a few days
- Applications taking more than 1 year

6.2.2 EXAMPLE OF APPLICATION IN ATACORA PROVINCE (BENIN)

The use of SEAN in Atacora Province (Benin) can be considered as representative for applications at regional and local level.

Objectives and participants in Atacora

The objectives of applying SEAN in Atacora province (Benin) were:
1. To analyse the existing problems and opportunities within the region;
2. To define a common vision and strategic goals for sustainable development that integrates environmental with economic and socio-institutional issues;
3. To create synergy and coordination between ongoing development projects and activities by involving local decision makers and other relevant actors;
4. To define regional institutional capacity development to support the decentralisation process;
5. To address the poverty and environmental fragility of the province.

About 30 organisations participated in various ways:
- Funding agencies: The ‘Centre Béninois pour le Développement Durable’ in Benin, and SNV that runs several projects in the province.
- Steering committee: representatives from the Ministry of Planning, Local Government, NGOs and funding agencies.
- Owner of the SEAN process: the elected ‘préfet’ of the province.
• Participants of workshops and field work: representatives of local communities, projects, NGOs, local government, private sector, donors and central government. Special attention was given to gender equity.
• Executing team: a local moderator (GERAM Bureau d’Etude), staff from local projects and from provincial services, a SEAN expert (AIDEEnvironment).
• Technical advisors: on an ad-hoc basis advice from University experts.

The SEAN process in Atacora
The 5 SEAN process phases (Figure 6.2) were executed as follows:
1. Preparation: this phase included defining objectives, information supply and lobby work, selection of participants, discussion on ownership, review of experiences, training of selected participants, agreement on terms of reference and budget, installation of executing team, technical committee and coordinating committee.
2. Scoping: during this phase, workshops were held at village level and at provincial level, to capture existing knowledge by going through the analytical tasks 1 to 8. Results of the village workshop were inputs to the provincial level workshop. Gaps of knowledge were identified for more detailed studies.
3. Detailed studies: detailed studies were undertaken, through interviews and surveys, of certain social groups (women, pastoralists, children, and urban settlers), on certain themes (e.g. soil fertility, migration patterns, trans-boundary pastoralist movements, agricultural extension and local traditions) and on certain sectors (e.g. gold mining, cotton production), in relation to tasks 1 to 8 mainly.
4. Synthesis and planning: this phase brought together insights and views generated in previous phases, during a workshop, to define a vision and strategic plan. This links up to analytical task 9.
5. Follow-up and monitoring: this ongoing phase focused at supporting implementation of the strategy, working out action plans, ensuring feed-back of results to stakeholders, monitoring and evaluation, and legalising the resulting strategy. This links up to analytical task 10.

Application of the 10 analytical tasks in Atacora
The 10 analytical tasks (Figure 6.1) generated the following results.

Task 1: Identification of relevant stakeholders and environmental functions. The main stakeholders were identified as functional groups using and managing the natural resources, including gender distinctions. Based upon their land-use systems, the environmental functions upon which they depend, directly or indirectly, were identified. Environmental functions were classified as production (10), carrier (6), regulation (8) and cultural (3) functions. Priorities among environmental functions were set based on their perceived value by stakeholders, based on studies and interviews. Descriptions were made of stakeholders, resource-use systems and environmental functions.

Task 2: Assessment of trends and cause-effect chains. An assessment was made of past and present trends of each environmental function, in terms of changes in quantity and/or quality, flows and/or stocks. Use was made of various types of indicators: state, pressure and response indicators, direct and

Task 3: Impacts of environmental trends. Related environmental trends were clustered, and impacts of these environmental trends on society were determined, in order to define the main current and future problems. This was done by looking at consequences for present stakeholders, for outside communities (off-site impacts), for future generations (by extrapolating current trends) and for natural
values (biodiversity) – together forming the group of ‘absent stakeholders’. Results were synthesised by means of a trend-impact matrix (Figure 6.5). The impacts on stakeholders were assessed for priority concerns: incomes, efficiency of income generating activities, health, resource conflicts and equity. Risks or economic consequences were assessed in a qualitative way.

**Task 4: Assessment of norms:** Norms, standards and thresholds involved were assessed as:
- **Bottom-lines:** when will current trends lead to collapse of environmental functions, or to unacceptable change as regards social or economic criteria for certain stakeholders;
- **Ideal situation:** what is the desirable situation for different actors, in terms of environmental qualities in their surroundings and socio-economic values of livelihood systems.
As norms are difficult to assess, standards are generally absent and thresholds not known, a qualitative assessment was made using insights and views from different actors involved.

**Task 5: Definition of environmental problems** Using a checklist and relevant information from tasks 1-4, environmental problems were defined in a transparent manner. In total 4 priority environmental problems were defined: decline of soil fertility, decline of cereal grain production, deforestation and decline of the availability of forest products, decline of urban living conditions. Each environmental problem was described in detail to ensure understanding about its integrated character and stakeholder perceptions about it. A good problem definition is essential to explain its causes.

**Task 6: Problem analysis:** Based on the problem-in-context approach, for each environmental problem were defined: the main causing activities, primary actors involved, their motivations and alternative options, underlying factors and root causes, secondary actors involved, etc. An actors field illustrates the interrelations between different actors involved (see Figure 2.9). Some of the main underlying factors and the associated actors are summarised in Box 6.2.

### Table 6.2: Summary of task 3: Impacts of priority environmental trends on key issues for stakeholders (each sign based on documented evidence)

<table>
<thead>
<tr>
<th>Environmental trends ↓</th>
<th>Present stakeholders</th>
<th>Absent stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final goals, key issues or indicators →</td>
<td>Incomes</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Soils fertility ↓↓</td>
<td>- $</td>
<td>-</td>
</tr>
<tr>
<td>Soils protection ↓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Space for forest ↓</td>
<td>-/+</td>
<td>-</td>
</tr>
<tr>
<td>Forest products ↓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Timber exploitation ↑</td>
<td>+</td>
<td>?</td>
</tr>
<tr>
<td>Urban settlements ↑</td>
<td>+</td>
<td>?</td>
</tr>
<tr>
<td>Soil / water pollution ↑</td>
<td>+</td>
<td>?</td>
</tr>
</tbody>
</table>

Legend: ↓ ↑ = direction of trends of environmental changes; 0 = no impact; - = negative impact; + = positive impact; ! = high risks; $= serious economic consequences; ? unknown impact

**Figure 6.5:** Summary of task 3: Impacts of priority environmental trends on key issues for stakeholders (each sign based on documented evidence)
Box 6.2: Result of task 6: a selection of underlying factors for the environmental problems in Atacora province (not indicated are the actors and institutions involved)

- High-level of seasonal rural emigration by the youth from remote areas, due to lack of investment opportunities beyond the agricultural sector
- Low-level of education among rural farmers, mainly women, causing poor implementation of extension messages and improved agricultural technologies
- Poor access to credit systems, by women mainly, and particularly for investments in land improvement that do not generate immediate results, other than promotion of cotton as a cash crop
- Predominance of traditional regulations of access and control of land resources, due to predominance of traditional hierarchical systems, constituting a constraint to land improvement
- Poor organisation of production sectors other than cotton, due to strong links between the agricultural extension service and the cotton industry, and strong interests by French markets
- Limited income opportunities outside the agricultural sector
- Non-application of organic fertilisers to improve soil fertility
- Poor quality of urban development plans, poor management of urban wastes

Task 7: Identification of opportunities. The main opportunities were identified. Structural opportunities are those that might constitute strategic choices to improve sustainable development, but which require testing and further development. These may include ecological (e.g. potentials for new cash crops), economic (e.g. emerging markets for new products or services) or institutional (e.g. decentralisation process) opportunities. Operational opportunities are local initiatives, successful projects and approaches, innovations (e.g. successful co-management experiences), ready for replication. Priorities were set and packages of interrelated opportunities were formed, i.e. opportunities that reinforce each other. Operational opportunities that could be linked to underlying factors identified in task 6 form priority development themes.

Task 8: Analysis of opportunities: Of selected structural opportunities an analysis was made to find out whether they can realistically be expected to stimulate sustainable development, on the basis of expected impacts and underlying factors. Use was made of an opportunity-impact matrix. Structural opportunities were selected on the basis of the possibilities to tackle problems and their underlying factors. In this way so-called win-win options can be designed. These can be considered as strategic options (see Fig. 6.6).

Task 9: Synthesis and strategic planning: Information from previous tasks was synthesised to define a desirable vision for development of the locality. The vision is used to make strategic choices, i.e. define a strategy with inter-sectoral strategic orientations, bringing together selected priority development options. Each strategic orientation was worked out in terms of targets, main actors involved, early actions based on operational opportunities, etc. Note that important underlying factors for which there are no opportunities constitute risks or assumptions. Figure 6.6 highlights the main elements of task 9, showing how one can develop a vision and strategic plan using results of earlier tasks.
Task 10: Design of an environmental monitoring plan. The design of an environmental monitoring plan was one of the analytical parts of task 10. Other important elements of follow-up were institutionalising the SEAN process, definition of a structure responsible for co-ordination, external communication and capacity building. The design of a monitoring plan can be done using the following sequence of steps:

1. Context analysis to acquire insight in key issues for policy or project
2. Definition of monitoring objectives (WHY monitoring environmental qualities?)
3. Determining the indicators and the reference situation (WHAT to monitor?)
4. Definition of the information flow (HOW to monitor the identified indicators?)
5. Definition of responsibilities, required means and costs (WHO will monitor the indicators?)
6. Analysis of the data and evaluation (what to do with the results?)
6.3 A REVIEW OF SEAN EXPERIENCES

By 2003 the SEAN method has been applied some 5 times, under different conditions and for different purposes. None of these applications has been formally evaluated, but there have been many informal reviews, workshops and an electronic conference, to define lessons learned, best practices, success factors and methodological aspects to further improve the SEAN method. Based on the resulting reports and overviews, in this chapter a brief ‘state of the art’ will be presented.

One can distinguish substantive and process results, both of which are important because:
• Without process results a good strategic plan will not be implemented (lack of commitment)
• Without a good vision and strategy committed persons do not undertake coordinated actions.

6.3.1 SUBSTANTIVE AND PROCESS RESULTS

Substantive results of SEAN applications have been: analysis of environmental problems and opportunities, identification of key actors, setting of sustainability standards, strategic goals and priorities, defining a vision, sectoral priorities and inter-sectoral programmes, early actions and partnerships. Most desirable for supporting institutions in change processes towards more sustainable development, would be an outcome structured in line with an adaptive management process (see section 6.1.5 and Box 6.1). The results from a SEAN application show much similarity between different localities in developing countries. Box 6.3 lists the main reoccurring priority themes.

Box 6.3. Priority themes resulting from using SEAN, summary from different localities

Ecological key issues
• Declining quantities and qualities of natural resources and biodiversity in rural areas (e.g. products such as wildlife and forest products, or services such as soil protection, soil fertility, forest quality, water balance);
• Deteriorating quality of living conditions in urban areas (air, soil, water);
• Declining importance attributed to cultural and aesthetic environmental values;
• Potentials for more efficient exploitation of natural resources through better access to resources and secured ownership rights (e.g. water resources, fisheries, wildlife);
• Potentials for more integrated and holistic resource management systems, building upon ecological principles and local knowledge (e.g. agroforestry, holistic rangeland management, integrated water management, urban waste recycling, integrated pest management, organic farming);
• Potentials for rehabilitation of environmental regulation functions (e.g. mangroves providing multiple functions including expensive coastal protection, water catchment protection);
• Potentials for low intensity / high value resource use systems (e.g. non timber forest products, eco-tourism, high value cash crops);
• Potentials for improved urban-rural interactions (e.g. urban wastes to use in rural areas, agricultural intensification in urban areas).

Socio-cultural key issues
• Low level of education and professional training, of environmental education and awareness on environmental problems and their causes (among all actors, at various institutional levels);
• Break-down of favourable cultural traditions and knowledge, e.g. of resource management practices;
• Poverty and unemployment leading to short term survival strategies with neglect of environmental consequences;
• Unequal access to and control over natural resources, technologies and information;
• High and/or uncontrolled demographic growth and/or migration patterns (particularly urban-rural dynamics) leading to accelerated pressure on environmental resources;
• Increasing insecurity and conflicts due to resource scarcity and deteriorating quality of living (both in rural and urban areas);
• Existing initiatives to counter trends of declining environmental quality and to stimulate change of dynamics (e.g. agricultural intensification, collect of urban wastes, efficient water management);
• Increasing commitment among politicians, private sector and civil society to address environmental issues;
• Existing levels of organisation, communication and spread of information, both formal and informal (e.g. water management committees, resource management platforms, religious networks).

Institutional key issues
• Environmental legislation not adapted to socio-cultural reality and not based on historical traditions, e.g. as regards resource ownership and management practices;
• Poor enforcement of legislation, prevalence of open access situations with no control, particularly common property resources;
• Poor participation of civil society in decision making processes and monitoring;
• Conflicting policies as regards management of natural resources;
• High levels of corruption and lack of morality, particularly within public institutions;
• Potentials of ongoing decentralisation processes and transfer of responsibilities to local levels (and for local bye laws);
• Potentials for information sharing and networking, both formal and informal;
• Increasing international pressure to address environmental issues international agreements and conventions;
• International standards on fair trade and certification of products according to ecological and social criteria;
• Gradually increasing awareness within private sector of the need to develop a ‘green image’.

Economic (and technological) key issues
• Technologies not adapted to local conditions, prevalence of standard solution packages and approaches;
• Inappropriate credit systems and financial incentives (subsidies) to support environmentally friendly technologies;
• Low level of value added at local level, benefits in market chain mainly at higher levels;
• Poor infrastructure / remoteness of marginal areas;
• Poor business skills at local levels, distrust of private sector.
• Improved, more efficient technologies for exploitation, transformation and conservation of products (e.g. local timber processing);
• Growing demand and markets for eco-products and services (e.g. eco-tourism, organic crops);
• Growing markets and employment opportunities around urban areas and in regions showing economic growth.

The similarity between different applications might result from the method being too prescriptive, thus leading to similar results under different circumstances. However, I think that the localities where SEAN has been applied also have similar problems and development opportunities. The results highlighted in Box 6.4 can be used as a reference list, but it is essential to work out these general issues and themes into concrete actions with objectives, targets and partners to be reached. To strike a balance between generalities (useful to summarise a range of related issues) and specifics (for operational actions) is a critical aspect of any strategic planning exercise.
The process results are more variable due to variation in institutional context:

- Insight on the risks of environmental degradation in the region concerned for socio-economic development, participants from economic sectors understanding and thinking about environment as a cross-cutting issue;
- Insight among policy makers on the importance of biodiversity and natural resources for economic development in their region, thinking in terms of opportunities and benefiting from innovators instead of acting in a defensive way;
- Strategic partnerships and forums of exchange, bringing together stakeholders on the basis of common interests and concerns;
- Claim making towards national level by local and regional authorities and communities on the need to provide resources and legal support to implement local level sustainable development;
- Enhanced collaboration and co-ordination between development actors such as Universities, regional authorities, projects, NGOs, donors, etc.;
- Training of various participants on environmental assessment tools.

6.3.2 SUCCESS FACTORS

Reviews of SEAN results and processes have given insight in the factors determining successful application. The following guidelines differentiate between pre-conditions (which normally cannot be influenced by the agencies involved) and success factors (which can be influenced). Also a distinction is made between three planning phases: (1) preparation, (2) implementation and (3) follow-up.

**Phase 1 : Preparation**

*Critical factors that cannot be directly influenced (conditions)*

1. *The right moment in a decision-making process.* This refers to the necessary linkage to an existing policy formulation process or planning cycle. For instance, a good moment can be when a new mayor has been elected, a new sectoral policy is formulated, a new strategy is developed or an existing one is reformulated or adjusted, etc. A bad moment is just before an election period.

2. *An enabling legal / institutional / political setting.* This refers to the following conditions:
   - A decentralisation act is accepted, with democratic procedures for elections and a mandate for local government to develop their own (strategic) plans
   - Local government with own financial means, from central government and through local taxes, to fund at least part of the plans with own funds
   - Devolution of line ministries, so that sectoral agencies are accountable to local government.

3. *Participation accepted as a principle.* There should be recognition of the need for participation in planning processes. In addition, it will be helpful if criteria of good governance are met, including respect of human rights (free press, gender equity, etc.).

*Critical factors that can be influenced*

4. *Local ownership.* There should be a clear demand from a national / local person or organisation (the ‘owner’) who is legitimate and accountable. The owner should be willing to coordinate the process and ensure follow-up.
5. **Willingness among key stakeholders and actors to participate.** Stakeholders and key actors should feel that by collaboration and participation their situation can be improved. It is important that influential private sector and policy makers are also involved. A steering committee may represent higher policy levels and sectoral agencies.

6. **Integration of planning tools in existing ones.** The proposed tools and methods should not be applied parallel to other planning processes and methods, but be integrated in existing ones.

7. **Expected results clearly defined.** It should be clear what the planning process will generate. This involves process-related outputs and concrete product/s. The structure (e.g. table of contents) of the resulting plan must be agreed upon. Providing examples of other applications can be helpful.

8. **Presence of technical support, sufficient funding and time.** Funds are required for workshops, studies, reporting, technical backstopping etc. Funding of participation (per diems) must be limited. The investment of local resources (time or funds) stimulates local ownership, and is an indicator for real commitment. The time required for a good planning process is at least 4 months.

9. **Presence of a skilled facilitator.** Necessary skills are: communication and conflict resolution, knowledge of planning processes, acceptable to all parties, knowledge of cultural specificities of the location, good networking capacities, knowledge of the local language. Another important skill is the ability to adjust the framework to the local context, and not use it in a rigid way.

10. **A minimum of environmental awareness and sense of urgency to address environmental issues.** The following factors can help generate such awareness:
   - Environmental education and information supply (e.g. by donors)
   - Pressure from donors or national agencies to comply to laws, standards, or treaties
   - Natural catastrophes (e.g. floods following a hurricane if forests have been cleared)
   - Health impacts from poor environmental management (e.g. excessive use of pesticides)
   - A strong dependency of livelihoods on natural resources (e.g. communities in remote areas)
   - Opportunities from better environmental management (e.g. incomes from organic products).

**Phase 2: Implementation.**

**Critical factors that cannot be directly influenced (conditions)**

11. **Participation by different political parties and interest groups.** This is to avoid that the resulting plan will be disregarded if the political system changes, e.g. after elections. Unfortunately, existing political tensions are usually reflected in who participates and who doesn’t.

**Critical factors that can be influenced**

12. **Owner of the process showing leadership and political commitment.** The owner of the process should play his/her role in coordinating the process, be engaged, committed and motivated.

13. **Implementation coordinated by a multi-disciplinary team.** This is critical to success, given the multi-sectoral and multi-disciplinary nature of environmental problems. Members of the multi-
disciplinary team should be able to understand each other, speak a common language. Expertise on strategic planning is also welcomed. Communication skills are relevant.

14. **Key actors remain involved.** Key actors having agreed to participate often do not turn up, apparently they have more to loose. They must be ‘kept on-board’ by information supply and lobby work.

15. **Ensure genuine interaction.** To have genuine interaction there is for workshops at different levels, working in thematic groups, feed-back mechanisms, public hearings, transparency, etc.). A communication strategy is useful.

16. **Develop an agreed upon vision, strategy and early actions.** These are essential components of a concrete outcome. Consensus may be the norm but difficult to achieve. Promising actions are linked to opportunities, they are ‘leverage points’ for change. Operational plans can be worked out later.

17. **Efficient time management.** The planning process should not take too much time before concrete actions are identified and undertaken. The process should not take longer than necessary if problems and opportunities are clear.

18. **Conflict identification and resolution.** There should be willingness to mention and openly discuss conflicts. Solving conflicts can strengthen commitment among participants.

19. **Have events that trigger the emotions.** Examples are cultural events, celebrations, parties, informal meetings etc. During these events the planning process can be mentioned or highlighted, or (preliminary) results be presented. Linkages should be made to existing cultural events.

**Phase 3 : Follow-up**

**Critical factors that cannot be directly influenced (conditions)**

20. **Accepted local management responsibility.** Private sector, donors or higher level agencies can frustrate ownership by influencing local institutions through political pressure or financial resources. This refers to the position of the owner within the political ‘power field’, which will be difficult to influence.

**Critical factors that can be influenced**

21. **Well-defined responsibilities for follow-up activities.** Working out clear tasks and responsibilities for implementing the plan is critical. This refers to the actors and institutions (to be) involved. These can be an environmental committee, a commission, a platform, etc.

22. **Coordinating structure is institutionalised.** It is important to institutionalise the coordinating structure. Ideally, this involves a legal rooting. The coordinating structure should be accepted / respected by all major actors / institutions involved.
23. **Continuity of support.** External support (technical, financial, human) should not be stopped once the planning process has been finalised. Support structures should remain in place during implementation.

24. **Existence of strategic alliances.** Strategic alliances, with well defined tasks and responsibilities are important to bring about change. Alliances between public and private sector are most useful. These can have the form of co-management arrangements.

25. **Early successes are reached and celebrated.** Celebrating early successes is important to generate a sense of commitment, and trigger the emotions.

26. **Implementation of monitoring and learning systems.** This is necessary to keep track of the continuous process of change in conformity to the developed strategy. There is room for open exchange of information on the monitoring results.

27. **Communication of the vision and results.** This might require an external communication and promotion strategy to inform a larger public.

28. **Updating of the strategic plan.** Once in a few years (3-5 years) the plan needs to be updated. Updating should also make use of monitoring results.

29. **Have sustained financial resources for follow-up.** Ideally, there is initial agreement to fund (part of) the resulting plan. In most cases additional funding should be acquired. This requires early communication with potentials funding agencies.
Box 6.5: Results of evaluations and reviews of SEAN experiences

Strengths of SEAN

- The focus at environmental opportunities, not at problems
- Its logical structure and well-defined analytical tasks, which allows for transparency of decisions
- Its flexibility for use at different levels, the possibility of selective use of tasks
- Its application at early moments of decision-making and design processes
- The attention for both process-oriented and substantive outputs
- Its integrative character (sustainable development orientation) allowing participants from different backgrounds and sectors to interact and collaborate
- Its participatory character, involving stakeholders from different levels.

Weaknesses of SEAN

- Its complex impression (e.g. final values, environmental functions, actors field)
- Its application being time consuming, at least 4 months (but time spent will be saved later by established commitment);
- Its strong environmental focus (difficult to accept by development oriented organisations)
- Its strong rational focus, with little room for emotional and non-rational elements
- Its unclarity as to whether and how it leads to concrete actions and decision-making
- The skills required of the facilitator of the process

6.3.3 STRENGTHS, WEAKNESSES AND CHALLENGES

The SEAN method is scale independent; it has been applied at local (municipality), meso (provincial, District) and macro (national) scale. Several field evaluations and an electronic conference (see www.seanplatform.org) were held to evaluate the experiences of SEAN applicants, in order to further improve the method. Box 6.5 gives a summary of insights.

Based on reviews and discussions, I identified challenges for further development of SEAN.

1. SEAN was developed to develop an overarching vision and a strategic plan, as a guidance for operational planning. However, implementation of the strategic plans through operational planning does not always take place. Concrete activities are often planned ad-hoc and not in line with the strategy. The challenge is to develop SEAN as a ‘decision support system’ that includes both facilitated issue discussion (to generate strategic and integrated insights), and agree upon concrete actions and decision making. In line with sustainable regional planning experiences in Australia (Dore and Woodhill, 1999), SEAN should help set long-term goals and support a learning and adaptive management approach. Here, early actions are also required.

2. More attention should be given to the process (ownership, participation, negotiation etc.), to generate new insights, agree upon key issues and stimulate creativity. The challenge is to strike a balance between the need for an open-ended participatory process, and the need to generate desirable actions and decision making. In line with sustainable regional planning experiences in Australia (Dore and Woodhill, 1999), SEAN should help set long-term goals and support a learning and adaptive management approach. Here, early actions are also required.

1 Note that strategic and integrated planning requires different capacities (integrative, holistic insights) than action planning (deductive, detailed planning).
results within certain time limits. Striking this balance seems one characteristic of alternative mechanisms to improve integration of environmental issues into policy making (Bailey and Renton, 1997). Early agreement on a number of promising and ‘obviously beneficial’ actions is important.

3. SEAN takes the environmental dimension as a starting point for an integrated approach. However, to achieve such integration in a systematic way remains difficult because other dimensions do not show similar links. The challenge is to further strengthen integration by moving from fragmented to more holistic viewpoints. For this to happen, there is need for initial agreement on common goals, standards and approaches, and good coordination to avoid divergence. One might start by a ‘wild’ approach, to allow different viewpoints to be expressed, or undertake parallel processes for different (sectoral) subjects to avoid loss of interest and to discuss concrete issues. Integration must not simply be a collection of multiple opinions. Strong integration is required to achieve institutional and political changes in order to support and implement sustainable development strategies (Gouldson and Murphy, 1996). Required time will be compensated by more efficient and non-conflicting policies.

4. The environmental focus of SEAN often constitutes a barrier for decision makers, because they feel the environment is not a priority. There is need to overcome a historical bias that environmental care used to set constraints to development. The challenge is to implement SEAN in such a way that the environmental focus becomes more acceptable to decision-makers. This can be achieved by starting out with concrete development issues (e.g. environmental opportunities, SEAN tasks 7 and 8). Where decision-makers do not see any need for an environmental focus, a bottom-up approach (starting out by local actors that perceive negative environmental impacts, the victims) could be a good option. It might be useful to make a typology indicating how to start in what context.

5. SEAN is often applied in an informal way, and is not linked to a formal decision-making process. As a result, the status of the results (a vision, a strategic plan) is often not clear, and might be easily neglected. The challenge is to involve and integrate SEAN in both formal and informal decision-making processes. Both contributions can be significant. In the end, endorsement of the substantive results is required to involve the public sector.

6. SEAN has an open-ended character. The resulting strategic plan often has a strong development focus, reflecting the interests of stakeholders. However, even if environmental priorities were agreed upon, short-term development-oriented priorities often ‘take over’. The challenge is to ensure that during and after the SEAN process critical environmental values (basic needs, values for future generations, global environmental values and nature) are respected. This is basically a matter of equity. The facilitator may represent the interests of ‘absent stakeholders’, There is also need to set concrete environmental standards, and presence of an agency to control respect of these standards.

7. It appeared difficult to involve the private sector, particularly where these have strong vested interests and cause negative environmental impacts. For instance, in Ghana we were not able to involve the gold mining sector. In that case the strategic plan will have a more advocacy character, uniting the ‘victims’. The challenge is to involve powerful players in the SEAN process by making them aware of mutual benefits or risks of environmental degradation. This could help build strategic partnerships between communities or NGOs and the private sector (see case study on oil palm in Annex I.3.4).
8. The SEAN process and framework typically represent a rational planning approach. The challenge is to integrate tools and methods that capture emotional and other non-rational motivations, particularly where choices have to be made on complex issues. This underlines the importance of process-analytical tools (see Chapter 5).

9. Most commonly SEAN has been applied at meso-scale (District, municipality). This level is suitable to identify micro-meso-macro linkages. But it is difficult to address macro-level factors and actors. The challenge is to include sufficient attention to contextual factors and actors at a level beyond the actual SEAN application.

10. Local ownership is a critical pre-condition for success. However, a high dependency on a local owner (e.g. elected mayor) is not sustainable. The challenge is to expand a sense of ownership from the owner to civil society and other key actors, by communication and information supply.
6.4 EXPERIENCES WITH THE ACTION NETWORK

I was involved in the Action Network programs of WWF as an external evaluator, from which I learned much about action-oriented planning. In this section I will briefly present these findings, which are entirely based on my own analyses and opinions. It will become clear how the Action Network approach is in many respects different from SEAN presented in the previous sections.

6.4.1 ORIGINS AND MAIN CHARACTERISTICS

The Action Network (AN) was set up in 1998 by WWF Netherlands as a response to:

1. **Persistent conservation threats.** Because of the ever increasing urgency of conservation there seemed need for a concerted innovation initiative to implement new strategic conservation thrusts such as ecoregion-based conservation, strategic partnerships, and multi-level approaches.

2. **New media.** The developments in information and communication technology (ICT) created new modalities for mobilisation of people, knowledge management, organisational change, fund raising and mediation between customers, donors and stakeholders.

3. **New insights on innovation and change.** New methods, tools and insights on communication, networking, learning and marketing mechanisms were emerging.

The AN consisted of 12 conservation programs in 8 countries, institutional strengthening in each of the 8 national offices, an AN support team and a WWF College to train AN participants and act as a structure for learning and exchange. The program as such terminated in 2001.

The AN can be considered as an initiative for innovation, stimulating experimenting, learning-by-doing and eventually organisational change. It aimed to pursue more effective conservation through (1) support and innovation for conservation programmes and (2) support and innovation for institutional development. In order to achieve change, a system for organisation-wide learning was established (Figure 6.7). It includes single loop learning (to improve and adjust programs), and double loop learning (to improve and adjust the organisation itself). Double loop learning was stimulated by the AN team through their role as change facilitators, by facilitating exchange and (distance) learning between the programs, and stimulating transparent reporting. In this way, the AN programs as a whole would create synergy, the whole being more than the sum of its parts.

The design up of the AN programs received relatively limited attention. It consisted of setting ambitious conservation goals and deciding upon a minimum of procedures and funding requirements, with specific targets and activities being defined ‘while doing’. Programs were run by motivated program leaders who were willing to embark on a process of joint learning. The programs then embarked on a process of exploration, experimentation and innovation, stimulated by reflection and learning processes, within the program, within the country and between AN programs. A substantial amount of funds were provided to each program (at average about 1 million US $ per year), based on a rough budget. Accountability was ex-post, so spending could be justified afterwards. This allowed great flexibility and rapid response (e.g. to new opportunities or events).

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2 See for more information: http://an.wwfnet.org for program reports, http://ld.panda.org for living documents, and actionroom@wwfnet.org for access or other information.
6.4.2 THE ACTION NETWORK DESIGN PRINCIPLES

During its implementation a number of design principles gradually emerged which characterised the AN programmes. The first seven are rather ‘technical’ design principles, applicable to the strategy of how to reach conservation goals, the other five are ‘institutional’ principles applicable to the team and the organisation. The interaction of these two sets of design principles is important.

1. **Magnification.** Magnification is the mobilisation of third parties and forces, the creation of a momentum and the generation of major impacts in pursuit of an objective that cannot be achieved with one’s own resources only. Mobilisation comprises the aspect of internalisation and capacity building of third parties to take over the momentum. There are three sub-principles required to achieve magnification:

   - **Creating a vision.** A vision gives a fundament and direction to the strategy. The vision should capture the biological future and its societal and human dimensions. The vision is a mechanism for motivating partners and others to join.
   - **Living examples.** Living examples show that the vision can be realised; they are accessible field models to convince others. A living example visually demonstrates the success of new conservation measures with benefits for different actors.
• Strategic partnerships. Strategic partnerships help magnify conservation successes of the program and the living example(s). They are based on win-win options with benefits for both parties. Partners are influential and/or innovative individuals, groups or organisations, mainly from non-conservation private sectors. Strategic partners take over the initiative or influence others within the sector to join, or reach new sectors, geographical scales and political levels.

2. Surfing the wave of opportunity. Under the metaphor ‘surfing the waves’ the aim is to be prepared for moments when rapid action can magnify and expedite a conservation issue onto the regional, national or global agenda. Such moments can be based on waves of media attention during political events, natural disasters, legal changes, etc. The ‘waves’ can be instrumental to address root causes and key actors, e.g. by stimulating societal and political change, or benefiting from ‘policy windows’. To be able to ‘surf the waves’, one requires sharp senses and scouting capacities (‘intelligence watch’, ‘early warning’).

3. Campaigning from the field. Campaigning from the field means that field experiences are used to influence key actors and society as a whole. National or international programs may be asked to support and help magnify successes. Thus, campaigning becomes a concerted effort that involves multiple levels. Campaigning and magnification strengthen each other.

4. Customer to customer to conservation. Customer to customer to conservation aims at connecting and mobilising society to help implement conservation mechanisms. The internet is used to connect groups of people, so that a conservation issue can potentially reach and engage many people. People are connected by creating web-based communities interested in a common conservation issue. By hosting these communities and stimulating self-organisation, internet-based communities can produce flows of money, goods, knowledge, information, civic engagement, and political advocacy.

5. Conservation leadership. Conservation leadership is essential to reach ambitious conservation goals and achieve magnification. It refers to a leadership quality that is successful from local to global arenas. Leadership must be based on credibility, vision and professionalism, as well as access to sufficient funds and human resources. Their team should be of sufficient size and capacity, and well enough equipped to take on design, action, communication, monitoring, learning and other tasks.

6. Organisational development. A well-equipped and credible support office is crucial for providing services to the program team and for leveraging conservation issues to achieve magnification. Vital assets are membership development, credibility, campaigning at national level, lobby to key actors at national level, networking with the private sector, press relations, recruitment, knowledge and contact networks.

7. Sharing knowledge / learning. Sharing knowledge means that the articulation and sharing of lessons is part of regular work, to make use of each other’s experiences before planning the next activity. It also requires professional, full-time networking staff and community-builders with understanding of organisational change processes. Sharing knowledge and learning lessons can be stimulated by peer reviews, exchange visits, e-networking and participation in activities to define lessons learned.

8. Real time transparency. Real time transparency implies rapid and continuous external communication, to allow others to have a look in day-to-day activities, the successes and failures. Real
time transparency can be stimulated through new techniques and attractive communication. In combination with an inviting style, real time transparency will help attract new supporters and partners.

9. Long term flexible funding. Continuity in terms of program activities, team work, partnerships, magnification activities, capacity building, etc. is critical to reach long term goals. Funding commitments should be 3-5 years to allow a program to reach successes. Flexible funding must allow the team to shift to new opportunities and priorities, in the context of agreed targets, transparency and accountability.

6.4.3 EXPERIENCES AND LESSONS LEARNED

To evaluate the AN program I used four performance criteria: effectiveness, innovation, institutional development and learning process, with criteria as (see Box 6.6). Some results are now highlighted.

The AN programs were rather ambitious, often covering large ecoregions (e.g. Yangtze basin, Kalimantan). Most programs were effective in reaching substantive conservation targets. However, in some cases obvious conservation priorities were not addressed, activities remained isolated or had limited impacts, without replication taking place. One aim had been to develop multi-level programs (with activities at local, national and international level), capable of addressing complex conservation problems such as deforestation and wetland degradation. These problems characteristically have local, national and international driving forces and actors involved (comparable to the problem of forest conversion in section 3.3). Such multi-level programs were however not effectively developed.

For many program leaders, the AN program was a unique opportunity to realise their conservation-oriented vision and create innovative break-through in terms of conservation instruments, for instance: collaboration with powerful private sector actors, innovative conservation approaches, strong lobby work, international conventions, considerable expansion of protected areas, legal reforms. Most innovative were programs that, apart from concrete field activities, focused at strategic issues such as: policy & legal issues, new coalitions and partnerships, capacity building and awareness raising campaigns. These activities were more effective when supported by a credible and efficiently operating national office. However, some programs did not score well on innovation, mainly because the conservation leaders were weak (in terms of visionary capacities mainly).

In terms of institutional development, major improvements were achieved in terms of: new ICT means and media involvement, capacities for rapid political action, communication strategy, thinking and acting more strategically, moving from rigid to adaptive planning, developing transboundary networks and working in multi-disciplinary teams. Funds were also used to leverage additional funds from Government, membership, donors and private sector. Thus, institutional development and concrete conservation programs reinforced each other. The collaboration with other environmental NGOs was limited, which is unfortunate as this would have created a broader basis for future conservation work.
Box 6.6: Four performance criteria to evaluate the Action Network Programs

1. **Effectiveness, measured by:**
   - Achieved results versus main goal and/or main objectives
   - Expected results in short term (1-2 years)
   - Future perspectives (3-5 years).

2. **Innovation in conservation mechanisms, measured by:**
   - Innovative in given context
   - Innovative in comparison to other AN programs: ‘internal benchmarking’
   - Innovative in WWF and conservation network: best professional judgement, ‘external benchmarking’

3. **Institutional Development, measured by:**
   - Enabling context by WWF Office: funding, communication, marketing, use of ICT, knowledge management
   - Management structure: efficiency, flexibility, empowerment of Program Leader
   - Human resources: experiences, skills, professionalism, motivation, leadership
   - Credibility: trusted, respected by others

4. **Learning process, measured by:**
   - Use of new concepts: bioregional approach, use of new mechanisms, integrated approach of components to reach magnification, strategic choices within a large temporal and spatial scale
   - Organisational change: drawing lessons, sharing lessons, generalising lessons, adjusting management process
   - Use of ICT for exchange, learning and mobilising; at local/regional, national and international level

Communication, regular meetings and e-networking between the programs was an essential component of the AN, to create synergy and learning between its components. Every program had its communication officer and substantial ICT means. However, more conventional learning tools like peer reviews, exchange visits, meetings and workshops were more appreciated than distance learning and communication, basically because programs did not consider the imperatives of an innovation and organisation-wide learning perspective as their priorities. There were difficulties in understanding the role of a change facilitator and understanding the long-term benefits of organisation-wide learning. Little time was spent at monitoring and evaluation, and consolidating what had been achieved. Consolidation is an essential element of organisational learning, and implies that lessons learned are brought together, impacts are evaluated, and conclusions are drawn as regards the effectiveness and applicability of the approach under different conditions. Consolidation should generate conclusions and suggestions as to how lessons learned can be made operational and be replicated.

While most AN programs achieved concrete conservation targets, and some were highly innovative in developing new conservation measures, interaction between the 12 programs also had an added value, although less than expected. It has been suggested that interaction could have been more effective when structured in terms of thematic or regional groupings.

The management of the Action Network has characteristics of what might be referred to as an adaptive management approach. Critical elements of such an approach were: flexible and substantial funding, flexible planning & setting targets, presenting new and inspiring design principles for conservation and institutional development, stimulating learning processes and exchange between
programs involved. As a result, new experiences in terms of conservation and institutional and organisational development were generated.

The Action Network support was already terminated by 2001, basically because higher echelons of WWF did not capture the essence of this innovative approach. The innovation initiative was generally considered as a one-time experiment of short duration. The short time span strongly reduced the effectiveness of organisational development and learning. It lead to a return to pragmatic short-term targets in order to achieve rapid visible results once it became clear that future funding was doubtful. Short-term targets were often not in line with the long-term vision and goal.

One can probably conclude that several factors interact in determining a successful conservation program:

• Application of the AN design principles (see above), of which most important are the opportunity- and action-oriented character. Note that some principles are difficult to apply in ‘non-Western’ settings (e.g. transparency, ex-post accountability, partnerships with private sector)
• A substantial amount of funds being available in a relatively flexible way
• A strong program leader and a supportive program and national office.

When these three conditions are met major successes can be achieved even in situations of considerable political instability (e.g. the case of Irian Jaya where in the middle of political turmoil major conservation successes were achieved by the AN program).
6.5 CONCLUSIONS

A comparison

Both strategic environmental analysis (SEAN) and the action network (AN) approach have worked with a design method. Differences between the two approaches are summarised in table 6.1.

Table 6.1: Main difference between the SEAN and the AN approach

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Strategic environmental analysis (SEAN)</th>
<th>Action network (AN) programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
<td>Limited, preferably voluntary participation, few capital inputs, low profile events</td>
<td>High inputs, in terms of capital and human resources, highly professional staff, high profile events</td>
</tr>
<tr>
<td>Process participants</td>
<td>Like integrated environmental management: all relevant stakeholders are involved. Key actors from supra-local level are often missing</td>
<td>Like co-management: early focus at key actors within a certain sector, often from supra-local level, strategic partnerships. Often neglect of local stakeholders</td>
</tr>
<tr>
<td>Outputs</td>
<td>Vision, strategy, future orientations, principles, monitoring indicators. Often short term action plans come up as well.</td>
<td>Concrete agreements and actions with key actors, lobby and communication events</td>
</tr>
<tr>
<td>Impacts</td>
<td>Limited environmental impacts, but strong foundation for follow-up activities through improved awareness, collaboration, sense of ownership, build up of capacities, etc.</td>
<td>Highly variable environmental impacts, sometimes considerable, but institutional sustainability may be doubtful.</td>
</tr>
</tbody>
</table>

SEAN applications generally involve many people and lead to broad understanding of local environmental and development problems, thus creating better conditions for stakeholder platforms, negotiation processes, mutual agreements and learning to take place (build up of trust, awareness, communication). The approach is like a round-table conference as characteristic for integrated environmental management (see section 5.4), resulting in agreement on a common vision and strategy, but few concrete agreements between key actors. Key actors from supra-local level, like powerful actors from the private sector, are often missing, which reduces the effectiveness of the resulting strategy. Consistency, rationality, analytical rigour and transparency are key words characterising the process. Both system-analytical tools and process-analytical tools are used (see Figure 5.6). Most important are probably steps 6 to 8, the problem and opportunity analysis, to create insight in the relations between problems, factors and actors at different levels, and opportunities to control these factors. The process is open-ended, environmental issues do not necessarily come up as priorities. In most cases the SEAN process generates a good basis for operational planning, implementation and collaboration. But SEAN applications have not commonly lead to effective and innovative actions.

On the contrary, most AN programs started undertaking actions almost without any planning, by building upon experiences of local program leaders. Some programs achieved successes and important
innovations, but others achieved few results while spending a considerable amount of money. The approach is comparable to that of co-management (section 5.4) because programs often focused on working with the key actors of a well-defined priority environmental problem, to reach concrete agreements on what could be done. In many cases a break-through was achieved through negotiation with a powerful private sector or government actor. Flexibility, communication, opportunity- and action-orientedness are key-words of the AN approach. The conservation agenda sets the long-term priorities. Process-analytical tools are used to involve key actors and reach the public.

Where program leaders are capable and the context is favourable, this approach can reach rapid results by taking advantage from existing opportunities. The identified actions often require substantial funding, which was available. But in other situations little was achieved, or it is unclear how the results fitted into a larger picture.

**Synergy between the two approaches**
SEAN-like planning and AN-like action-orientedness seems a good mix. Ideally, an integrated environmental management approach similar to SEAN is a continuous process of analysis, reflection and negotiation. This is important to generate commitment, communicate the vision, ensure learning, collaboration, etc. At the same time, urgent issues and concrete opportunities should be picked up as soon as possible, agreements be made and co-management arrangements established, without unnecessary delay by analysis or planning. This requires the availability of funds, which in most cases where SEAN was applied were missing.

The experiences showed that developing a long-term vision and strategy requires a certain level of conceptual reflection. In stead of defining a vision and strategy at early phases of design, one could develop a strategy as the consolidation of ‘a pattern in a stream of actions’, or ‘an emerging strategy’, generated through action-oriented analysis and learning (see section 4.3).

Based on these insights, I developed in Table 6.2 an overview of what, ideally, an ‘adaptive planning’ approach should imply, as compared to a more conventional ‘linear planning’ approach.
### Table 6.2: Comparison between a linear design and an adaptive planning approach

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Linear planning approach</th>
<th>Adaptive planning approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Principles</strong></td>
<td>• Emphasis on rationality and logic</td>
<td>• Integrating rationality, intuition and creativity</td>
</tr>
<tr>
<td></td>
<td>• Opponents and resistance should be avoided by good design process</td>
<td>• Opponents and resistance must be part of change processes</td>
</tr>
<tr>
<td></td>
<td>• Failure should be avoided</td>
<td>• Failure is a moment for learning</td>
</tr>
<tr>
<td></td>
<td>• If targets are not reached: add new targets, adjust means ('more of the same')</td>
<td>• If targets are not reached: rethink vision and strategy</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td>• Detailed initial design as a one-time event leading to a comprehensive plan</td>
<td>• Rapid initial design, ambitious targets, early focus at key factors and actors</td>
</tr>
<tr>
<td></td>
<td>• Achievable targets; measures and process are means to reach targets; milestones are relatively fixed</td>
<td>• Actions planned in line with vision, adherence to operational principles</td>
</tr>
<tr>
<td></td>
<td>• Attention for certainties and uniformity</td>
<td>• Adjust milestones using lessons learned and monitoring results</td>
</tr>
<tr>
<td></td>
<td>• Limited attention for opportunities</td>
<td>• Attention to uncertainties and context</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Focus at local and contextual opportunities</td>
</tr>
<tr>
<td><strong>Organisation</strong></td>
<td>• Uniformity and standardisation of targets and means</td>
<td>• Room for diversity and change processes</td>
</tr>
<tr>
<td></td>
<td>• Structured organisation, strict budgeting</td>
<td>• Flexible organisation and funding</td>
</tr>
<tr>
<td></td>
<td>• Ex-ante justification of spending</td>
<td>• Ex-post justification of spending based on accountability and transparency</td>
</tr>
<tr>
<td></td>
<td>• Planning precedes doing; management by project or policy cycle</td>
<td>• Planning and doing interact; learning organisations</td>
</tr>
<tr>
<td><strong>Team spirit</strong></td>
<td>• Implementers (doers) are sub-ordinate to planners (thinkers)</td>
<td>• Overlapping roles of implementers and planners; empowered leaders</td>
</tr>
<tr>
<td></td>
<td>• Hierarchical decision-making</td>
<td>• Room for intuition and innovation</td>
</tr>
<tr>
<td></td>
<td>• Busy to reach concrete targets</td>
<td>• Time for reflection, learning and consolidation</td>
</tr>
</tbody>
</table>
7. SEAN-ERA: A FRAMEWORK AND PRINCIPLES FOR SUSTAINABILITY PLANNING

In Chapter 1, I presented my vision of how people take into account environmental sustainability. The objectives of this book (see Chapter 1) are the strategic orientations to realise this vision, and they form the structure of this chapter. The objectives are:

1. To develop a framework to support stakeholders in integrating environmental sustainability issues into planning processes, including the definition of institutional requirements
2. To develop guidelines to facilitate the above planning process, in such a way that it meets criteria of sound decision-making and good governance.

In this chapter I will realise these objectives. The framework and principles are developed on the basis of results and insights from previous chapters. They form a decision-support method. The method will be referred to as SEAN-ERA, as it is based on my experiences with Strategic Environmental Analysis (SEAN), but improved and enriched by the three ERA drivers introduced in this chapter.

Section 7.1. The ERA drivers: emotions, rationality and early actions
I will here present the ERA drivers as a new unifying concept. The three drivers are the emotional / intuition driver, the rational / system-analytical driver, and the early actions driver. The ERA drivers together form the basis for organisational change and for applying an adaptive management approach.

Section 7.2. The framework
The framework includes eight tasks to deal with the substance of how to integrate environmental sustainability issues into a planning process. The tasks focus at the relations between development and environmental sustainability, a location-specific vision and strategy, and institutional requirements to implement this strategy. The eight planning tasks are performed by making use of the ERA drivers.

Section 7.3. Guidelines for the planning process
Guidelines for the planning process ensure that the process meets criteria of sound decision-making, to generate mutual understanding and trust, commitment to apply the resulting strategy, networking and partnerships, and other 'human' results for implementation of the planned activities. A set of eight general principles with associated explanations and guidelines will be presented.

Section 7.4. Inner senses for sustainability
This section deals with different aspects of connectedness of people with their social surroundings, with outside nature, and with their inner nature. Connectedness is fundamental to nourish inner capacities and senses which are good for people and organisations to maintain a sustainability focus. This section has a largely exploratory character.

Section 7.5. Applicability
I will indicate how this framework and principles may be applied with the limitations or remaining questions, leading to research for further development.
Chapter 7 – SEAN-ERA: a framework and principles for sustainability planning

7.1 THE ERA DRIVERS: EMOTIONS, RATIONALITY AND EARLY ACTION

The ERA drivers, as a new unifying concept, are central to my planning framework and process. In fact, they represent three types of ‘logics’, knowledge and experience that strongly influence planning, as well as subsequent phases of implementation and management. The three ERA drivers are important for successful organisational learning, as part of institutional change.

So let me introduce the ERA drivers:
1. The Emotional / intuitive driver (E)
2. The Rational / system-analytical driver (R)
3. The early Actions driver (A)

The three ERA drivers are necessary to adequately perform the tasks of the planning framework (section 7.2), and are part and parcel of the design and planning process (section 7.3) (Figure 7.1). Synergy between the three drivers is indispensable; if one is missing or coherence between the three drivers is poor, desirable change will be difficult to achieve, or to sustain.

Basically, recognition of the three drivers is making explicit how decision-making and change processes work in reality. In their review of theories and research on organisational change, Weick and Westley (1999) conclude that “much empirical work on both individual behaviour and organisational processes rests on a negative theme of counter-evidence to rational choice assumptions”. The concept of ERA drivers aims to provide an alternative 3-dimensional engine for organisational learning and decision-making that links up to empirical reality, without losing links with rational choice assumptions.

The idea and justification for the three ERA drivers can be found in several previous chapters. I demonstrated in Section 4.3 that effective environmental management is not only based on rational and objective knowledge, but also on non-rational and subjective knowledge. The latter category is an important component determining the capacity to be adaptive (Section 4.3.5). Decision-making is strongly influenced by belief systems, paradigms, narratives, political models, values and societal...
norms. These aspects are rooted within human emotions, and often tend to overshadow objective rationality (Section 2.4.3). Emotions may change on the basis of social interactions, concrete experiences and learning based on that. I concluded in Section 5.3 that for effective planning there is need for two types of planning and design methods and tools: from a process-analytical and learning perspective (capturing emotions, social interaction and learning), and from a system-analytical perspective (capturing rational analysis).

Rationality and emotions interact and are complementary in different ways. Commonly, emotions, intuition and experience give a first indication of what is important, while rationality is useful to verify these impressions and work out details. Weick and Westley (1999) speak about emotions as disorder and being disruptive, while rationality provides apparent order. Narratives, stories, but also jokes are ways of expressing emotions and the unconscious. Organisational learning requires the juxtaposition of these two components.

But the need for a third driver was also demonstrated. There is need for early actions, responding to promising initiatives, ongoing changes, societal dynamics and ‘windows of opportunity’ where and when these emerge (Section 4.3.5). Some early actions are ‘obviously good’, i.e. are obviously in line with desirable values and norms (for more sustainable development). Preferably this type of early actions links up with existing social dynamics and ongoing actions (‘hooked-on’). They are small but inspirational wins in a process of change. Early actions can also be undertaken to test out, explore, gain experience, improvise, get a feeling about ecological and social dynamics, power relations, etc. In that case they can be initiated during the planning process (‘self-designed’). Early actions generate concrete experiences and innovations that form valuable inputs to the rational-analytical and emotional drivers. They are essential for organisational learning are important to feed experiences and lessons into an adaptive management approach. In Chapter 6, I demonstrated the synergy that exists between early actions and rational analysis on the basis of experiences with strategic environmental analysis and the action network programmes. In the absence of early actions there might be low motivation to undertake a long planning process, or absence of lessons on how to implement the resulting plan. But without rational analysis there will be little coherence and direction among the multitude of small successes. Summarising, E provides commitment, R provides long-term and realistic insights, and A provides valuable successes and lessons to gain experiences (Table 7.1).

Table 7.1: Consequences of the weight given to the ERA drivers during a planning process

<table>
<thead>
<tr>
<th>Emotions</th>
<th>Rationality</th>
<th>early Actions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td>Good analysis, better understanding, piles of plans and new ideas; but unrealistic plans, difficult to make choices, to get started, a bad feeling (what did we actually DO?)</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td>Good studies, excellent plans, actions supporting rational insights, well-prepared pilots; but poor commitment, more of the same, no break-through, little surprise or creativity</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td>Plenty of initiatives, hot discussions, high commitment, some early successes; but poor long-term plans, little coherence and consistency, considerable social or ecological risks.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Good and realistic plans, high commitment, learning by ‘guided’ doing, one step back to make two steps forward, slow but consistent change, break-through and surprise</td>
</tr>
</tbody>
</table>
7.2 THE SEAN-ERA PLANNING FRAMEWORK

7.2.1 EIGHT TASKS

I will now work out an analytical framework with eight tasks to integrate environmental issues into development planning processes. I will first explain how these are anchored in previous chapters.

I demonstrated in Chapter 2 the multi-functionality of the environment, and explained environmental resilience in a broader context of sustainable development. These are basic insights for any design that aims to take into account environmental sustainability. Empirical evidence of case studies presented in Annex I demonstrated the complex interrelations between the bio-physical environment and human society, and the need to look at factors and actors within multiple sectors and at different levels. These insights were worked out in a two-pronged analytical approach presented in Chapter 3: one prong based on a rather detailed situational analysis, the other aimed at taking into account the broader (large-scale and long-term) macro-context. Many of these elements can be found back in land-use planning methods (Chapter 5) and the SEAN method of analysis and strategic planning (Chapter 6). I have captured the essence of these experiences in the first five tasks of the framework. The concrete results of these tasks are a strategic plan, including a vision, strategic orientations, agreement on key values and principles or standards, and promising actions.

Clearly, implementation of the strategic plan requires sufficient capacities within the institutions involved. Understanding how institutions operate and how decision-making takes place has been the subject of Chapter 4. The next three tasks of the framework deal with the questions of how and by whom the strategic plan will be implemented and monitored, and what capacities and structures are needed among the organisations and actors involved. Part of it is also a vision about the gradual evolution towards environmental governance.

The eight tasks are elaborated in the next sections. They can be summarised as follows:

1. **Stakeholders and environmental values.** What environmental functions are most appreciated by which stakeholders? Which functions are important for future generations? What are desirable qualities to maintain and develop?
2. **Biodiversity and resilience.** What biodiversity and ecological processes should be maintained, at what scale level and where, to maintain stability and desirable resilience of priority environmental values?
3. **Future environmental state and bottom-line standards.** What ‘environmental state’ is expected (ongoing changes)? What is a desirable vision of the future? What are hotspots of discrepancy? What are bottom-line standards?
4. **Knots and levers: integrated analysis.** What factors and actors influence the current environmental state? What are the knots (problem areas) and levers (opportunities)? What are long-term strategic options, partners and short-term priority actions?
5. **Local-global resource-trade cycles.** How are local environmental problems and socio-economic dynamics caused by global resource-trade cycles? What are the key actors driving these cycles? What are opportunities for change?
6. **Institutional analysis.** What are the characteristics of the existing environmental management and decision-making process? What support is needed to realise the defined strategy?
7. **Towards environmental governance.** What institutional model for environmental management do we want? So what is the long-term focus of institutional support?
8. **Monitoring change.** What are critical indicators to monitor environmental change? How will the results be used to learn from, and adapt the strategy?
Figure 7.2: Overview of the analytical framework

Figure 7.2 shows how these eight tasks are interrelated. Three clusters can be distinguished:

- **Cluster 1 (tasks 1 to 5)** focus at the development context
- **Cluster 2 (task 6)** focus at the institutional context
- **Cluster 3 (tasks 7 to 8)** focus at matching these two.

### 7.2.2 DESCRIPTION OF EIGHT TASKS OF THE PLANNING FRAMEWORK

The eight tasks are worked out by matching with the three ERA drivers. Note that the subject or scope of using these tasks can be a geographical area (locality) or a sector at a certain scale level X. The framework is scale-independent.
## Task 1: Stakeholders and environmental values

**Main questions:** What environmental functions are most appreciated by which stakeholders? Which functions are important for future generations? What are desirable qualities to maintain and develop?

### Description

Insight in environmental functions providing goods and services for socio-economic well-being is a basis to define the goals of environmental management. In particular, poor, marginal, indigenous or minority groups often strongly depend upon environmental goods and services, for production, security and health. For other social groups the relations are often more indirect. Insight in critical goods and services for stakeholders leads to agreement on key environmental values, i.e. values we don’t want to lose. Future generations, communities beyond the locality but subject to environmental impacts by trade-off, and nature itself are also stakeholders to consider. Caring for these stakeholders is a matter of inter- and intra-generational equity (see Box 7.1). Special attention is required for public goods and common property resources functioning at supralocal levels, and to non-economic values (cultural, ethical and emotional).

### Emotions driver

- What environmental values do you appreciate most? Which have been lost?
- What is your cultural heritage? What landscapes do you love? What beautiful landscapes have been lost?
- What nature do you want to conserve? What do you feel about nature as part of your moral commitments? What plants and animals have special values?
- What typical products from natural resources of our locality are you proud of?

### Rational-analytical driver

- What are important land- or resource-use systems? What environmental functions do these systems depend upon, directly or indirectly?
- Which functions are important for livelihoods of minority / poor / marginal social groups? What options are there for future generations?
- What are ecological thresholds, societal norms or standards with respect to qualities to maintain? How do these vary for different stakeholders?

### Examples of early actions

- Mobilise people to collect stories on nature and cultural traditions and events with linkages to nature
- Facilitate an inventory of indigenous natural resource management practices
- Stimulate voluntary social action to manage or rehabilitate nature
- Stimulate joint fact finding on the current state of environmental values
- Organise exchange visits to social groups or areas where environmental impacts are visible (e.g. North – South exchange)
- Set-up a simple environmental monitoring system for social groups

### Desirable outputs

- Insight in land- or resource-use systems, and how these depend upon environmental production, regulation and enrichment functions
- A short-list of key environmental values, with linkages to the main interest groups / stakeholders, including poor groups and absent stakeholders
Box 7.1: Commonly under-represented or absent stakeholders with environmental interests

- Poor groups (e.g. forest dwellers, pastoralists in arid regions, farmers in remote areas)
- Minority groups (e.g. hunter-gatherers, ethnic groups)
- Marginal groups (e.g. labourers, urban squatters, landless)
- Women (e.g. female headed households, women farmer groups, women cooperatives) and children (youth groups, sports clubs)
- Future generations
- Outside communities (e.g. downstream communities, areas of immigration)
- Biodiversity / intrinsic values of nature

Useful tools and connections to previous Chapters:

- Environmental functions and values (Section 2.1)
- Checklist of situational analysis (Section 3.2.2)
- SEAN steps 1 and 4 (Section 6.2).
### Task 2: Biodiversity, stability and resilience

**Main questions:** What biodiversity and ecological processes should be maintained, at what scale level and where, to maintain stability and desirable resilience of priority environmental values?

| Description | Resilience is the key requirement for environmental sustainability, and this in turn is determined by space for biodiversity and ecological processes. We need to look at biodiversity and ecological processes required to maintain desirable levels of (short-term) stability and (long-term) resilience of priority environmental values. This brings us to biodiversity at level X, but also within a broader context, at scale levels and time horizons beyond our direct interest (at least scale level X+1, e.g. (eco-)regional including rural-urban relations), as here the ecological processes operate that determine resilience at level X (see Box 7.2). The relations between environmental resilience and biodiversity should be understood, and the need to maintain buffers and reserves for resilience in case of major changes and external shocks and as optionality for future generations. Sustainable use does not suffice. |
| Emotions driver | • What environmental changes (events, catastrophes) affected you and your people in the past? Is the environment you are living in stable or unstable?  
• What environmental changes are you afraid of? What current qualities or possible changes are unacceptable? How are these determined by others?  
• Do you accept extermination of species? For which species?  
• Do you believe in the self-regulatory mechanisms of nature? If not, do you have confidence in human management? What is a good balance?  
• Are you aware of the trade-off of your behaviour (consumption, exploitation) for others? |
| Rational-analytical driver | • Is the environmental situation fragile or robust (resilience and stability)?  
• What are environmental risks with respect to environmental values, for different stakeholders? What changes are unacceptable?  
• Which are the ecological processes at different levels (X, X+1 and beyond) that determine the quality of environmental goods and services?  
• What biodiversity, buffer zones and reserves should be maintained to sustain these ecological processes, and be prepared for unexpected events?  
• What human management inputs are required to compensate for loss of ecological stability and resilience? What are the changes and the risks? |
| Examples of early actions | • Rapid response to environmental events with unacceptable impacts (floods, droughts), to raise public and political awareness  
• Joint action on obviously good environmental management activities, like anti-erosion works, tree planting, waste collection, pest management, etc.  
• Make a causal chain of environmental effects, e.g. upstream-downstream, visit sites and discuss with stakeholders  
• Establish projects to demonstrate the functioning of ecological processes, e.g. for soil protection, flood protection, water purification, air purification, etc. |
| Desirable outputs | • Acceptable environmental risks based on socio-economic impacts, desirable levels of stability and resilience for priority environmental values  
• Defined buffer zones, reserves and ecological networks with biodiversity and critical ecological processes, for stability and resilience  
• Management guidelines, environmental standards and indicators for monitoring risks |
Box 7.2: Examples of ecological and administrative units at different scale levels

<table>
<thead>
<tr>
<th>Ecological scale levels</th>
<th>Administrative scale levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>- plot / micro-site</td>
<td>- agricultural field, pond</td>
</tr>
<tr>
<td>- soil and vegetation unit</td>
<td>- household</td>
</tr>
<tr>
<td>- habitat / micro-catchment / lake (ecotopes)</td>
<td>- neighbourhood / community</td>
</tr>
<tr>
<td>- catchment / coastal zone (ecosystems)</td>
<td>- municipality</td>
</tr>
<tr>
<td>- watershed / sea / region (ecoregion)</td>
<td>- district / province</td>
</tr>
<tr>
<td>- continent / ocean</td>
<td>- state / region</td>
</tr>
<tr>
<td>- world</td>
<td>- United Nations, global NGOs</td>
</tr>
</tbody>
</table>

Useful tools and connections to previous Chapters:
- On stability and resilience, Section 2.2, example Box 2.1
- On environmental sustainability, Section 2.3
- On resilience and economic development, see Figure 2.10
- On complex adaptive systems, section 2.5
- Examples of people coping with environmental complexity, case studies Annex I
- SEAN steps 1 to 4 (Section 6.2).
### Task 3: Future environmental state and bottom-line standards

**Main questions:** What ‘environmental state’ is expected (ongoing changes)? What is a desirable vision of the future? What are hotspots of discrepancy? What are bottom-line standards to respect?

<table>
<thead>
<tr>
<th>Description</th>
<th>The interactions between human society and the environment are characterised by states and transitions. The acceptability of each environmental state (with associated quality of functions, stability and resilience) varies in time, by locality and stakeholder (e.g. the winners and losers of environmental change). Strategic planning implies anticipating on the future. Extrapolation of trends is not useful because many ecosystems and social systems are complex adaptive systems with unpredictability and abrupt changes. To do better than guessing or ‘wait and see’, we can look at historical patterns of change, make comparisons with similar localities and understand driving forces. The macro-patterns of change (Box 7.3) can be used as a reference to anticipate on changes and define a realistic and desirable vision. The hotspots of discrepancy between current trends, the vision and defined bottom-line standards (to avoid unacceptable risks) are guidance for designing a strategy.</th>
</tr>
</thead>
</table>
| **Emotions driver** | • Are you satisfied with the current environmental qualities? And what about the changes taking place? Do others agree with these perceptions?  
• Who are the winners and losers of the current situation? Do you find these differences acceptable? What level of equity is desirable?  
• What are your dreams about a desirable future? Can you visualise your children enjoying this future? Do others agree with this future?  
• What ecosystem changes do you consider as totally unacceptable? |
| **Rational-analytical driver** | • Looking at the macro-patterns and states, what is the current situation? Is the current state one of intact nature, degradation or intermediate?  
• What are the current changes? What are threats and what are opportunities? What direction of change can be expected?  
• What future state is expected, for the region as a whole, or for a certain sector? How can we anticipate on expected changes to make it more sustainable? What are bottom-line standards to ensure sufficient sustainability?  
• What are possible development scenarios and a good vision? |
| **Examples of early actions** | • Discuss with different stakeholders attractive scenarios or visions, exchange these, discuss the consequences, try to establish a common ground  
• Jointly draw maps that show the future vision, visualise future landscapes  
• Exchange visits to comparable localities in another development state; draw lessons  
• Communicate your own development vision, and discuss with others  
• Ask poor social groups, or stakeholders in trade-off situations, on their vision |
| **Desirable outputs** | • Description of current development state and its main characteristics, current threats and opportunities, winners and losers  
• A vision for a desirable future, with a time horizon  
• Bottom-line standards to respect, particularly in view of risks for minority / poor / marginal social groups and future generations  
• Defined hotspots of discrepancy with current situation, strategic orientations to overcome the gap |
Box 7.3. Land-use states

Based on empirical evidence from the case studies in Annex I and literature I identified seven land-use states:

1. Nature and people in harmony
2. Extraction
3. Extensive land-use by rapid expansion and extensive land-use by stable communities
4. Intensive land-use with low external inputs
5. Intensive land-use with high external inputs
6. Restoration of natural resources and processes for economic reasons
7. Restoration of nature for immaterial needs

In Section 3.3.4 these land-use states are described and characterised by their spatial patterns, the major driving forces, the actors involved, the environmental sustainability aspects, the opportunities for a desirable transition, and the associated human perception to nature.

Useful tools and connections to previous Chapters:
- On complex adaptive systems, Section 2.5
- Guidelines for a macro-level analysis Section 3.3, Figure 3.4, Table 3.2
- Examples of land-use states and transitions, case studies in Annex I
- SEAN step 4 (Section 6.2).
### Task 4: Knots and levers: integrated analysis

#### Main questions:
What factors and actors influence the current environmental state? What are knots (problem areas) and levers (opportunities)? What are long-term strategic options, partners and short-term priority actions?

#### Description
Environmental issues are always associated with socio-economic development sectors, in two ways: as driving forces and root causes of problems, and as opportunities for better environmental management. To identify critical driving forces (knots) and opportunities (levers) and the actors involved, there is need to gain insight in the interrelations and trade-off between sectors and trends at local, national and international levels (see Box 7.4). One could distinguish long-term potentials to realise the vision and operational opportunities for short-term successes (Figure 7.3). There is potential for synergy between different sectors and interests.

#### Emotions driver
- What is the success story in line with the vision that everyone should know? Who was involved? What can be done to expand it?
- Who are champions, people or organisations you admire because they carry your vision?
- What are people or organisations whom you trust? Can they be your partners?
- Who is responsible for the undesirable environmental change? Who is behind the screens?
- What are the major constraints to realise your vision? Do you know of any possibilities to control these?

#### Rational-analytical driver
- For well-defined environmental problems, what are key factors at different levels, and within different sectors, and how do these relate? What are the associated key actors? The emphasis is at level X+1, where ecological processes determining resilience operate.
- What are knots and levers in the system-analytical network? What are opportunities to realise the vision, both short- and long-term? What are innovators and early adopters?
- What are the strategic orientations and partners to realise the vision?

#### Examples of early actions
- Discuss the main environmental problem: who really benefits? Who pulls the strings? Undertake lobby work against obviously harmful policies and the associated key actors.
- Spread and promote successful projects or activities.
- Discuss with victims of environmental problems, help them in their solutions.
- Set up demonstration projects with innovators, work with champions.
- Establish a negotiation platform with key actors, try to solve conflicts.
- Write an article in the newspaper about a bad policy or promising innovation.

#### Desirable outputs
- Insight in key factors and actors causing environmental problems within different sectors.
- A strategy to tackle knots and realise levers.
- Short-term opportunities to replicate, and long-term potentials to focus upon (Figure 7.3).
- Strategic partnerships with innovators and early adopters.
- Win-win options of economic development (e.g. poverty reduction) and environmental management.
Box 7.4. A matrix for integrated analysis of factors, opportunities and actors influencing environmental values

<table>
<thead>
<tr>
<th>Levels</th>
<th>Economic</th>
<th>Socio-cultural</th>
<th>Institutional</th>
<th>Technical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>Factors:</td>
<td>Id.</td>
<td>Id.</td>
<td>Id.</td>
</tr>
<tr>
<td></td>
<td>Actors:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opportunities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>Id.</td>
<td>Id.</td>
<td>Id.</td>
<td>Id.</td>
</tr>
<tr>
<td>International</td>
<td>Id.</td>
<td>Id.</td>
<td>Id.</td>
<td>Id.</td>
</tr>
</tbody>
</table>

Useful tools and connections to previous Chapters:
- Problem in Context method, Section 2.4, Figure 2.12
- SEAN tasks 5-9 (Section 6.2), Box 6.4, Figure 6.3.
- Collaborative management approaches, Section 5.4
- SEAN results, Section 6.3, Box 6.4.
## Task 5: Local-global resource-trade cycles

**Main questions:** How are local environmental problems and socio-economic dynamics caused by global resource-trade cycles? What are the key actors driving these cycles? What are opportunities for change?

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local resources are increasingly subject to global trade, to generate local incomes and foreign exchange. This often constitutes the main driving force of resource degradation, such as forest conversion. There are two basic flows that connect consumer markets with the resource: capital flows and product flows. Capital is channelled to the local producers through financial institutions. The producer’s products are channelled to the consumer market by a range of actors in the chain-of-custody. The consumers through their savings contribute to create the financial resources that feed the process. It is critical to understand these cycles, and identify the main actors involved, in order to be able to design solution strategies.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emotions driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Which of your local resources are used for intensive export trade? Are you satisfied with the incomes from this trade? Does it compensate the resulting resource degradation?</td>
</tr>
<tr>
<td>• Do you accept your resource base being degraded for far-off consumer markets?</td>
</tr>
<tr>
<td>• Do you know who are the key actors driving these resource-exploitation processes? Do you trust these key actors? Are they involved in illegal activities?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rational-analytical driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Which valuable resources from the locality are subject to global trade?</td>
</tr>
<tr>
<td>• Do the revenues for local producers reflect the economic value of the resource base and the impacts on ecosystems and biodiversity?</td>
</tr>
<tr>
<td>• Which are the key actors involved in the resource trade?</td>
</tr>
<tr>
<td>• How are these resource trade cycles financed? What global actors are pulling the strings? How are consumers involved in financing these trade cycles?</td>
</tr>
<tr>
<td>• Where do we find opportunities and innovators to bring about positive change?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Early actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Discuss with producers the acceptability of resources disappearing to far-off consumer markets. Are the revenues worthwhile? Make a rough cost-benefit analysis.</td>
</tr>
<tr>
<td>• Visit locations where the environment has been effectively stripped of its resources. Draw lessons and decide how this can be avoided. Publish the results.</td>
</tr>
<tr>
<td>• Undertake inventories to find out whether consumers and funding institutions are aware of the damage they are causing. Stimulate a public debate.</td>
</tr>
<tr>
<td>• Undertake lobby actions to create awareness among consumers. Put key actors under pressure.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Desirable outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Insight in global resource-trade cycles driving local resource degradation: the chain-of custody and the key actors involved</td>
</tr>
<tr>
<td>• The flow of financial resources funding the product chain, the key actors involved</td>
</tr>
<tr>
<td>• Opportunities and innovators constituting possibilities to bring about positive change in unsustainable resource-trade cycles.</td>
</tr>
<tr>
<td>• ‘Pulling’ policy options, i.e. those providing alternatives and win-win options for more sustainable resource use, and ‘pushing’ policy options, i.e. those aimed at reducing illegal and unsustainable practices.</td>
</tr>
</tbody>
</table>

**Useful tools and connections to previous Chapters:**
- Problem-in-context model and actor’s field: Section 2.4, Figure 2.12; SEAN step 6
- Resource-trade cycle analysis: Annex I, Section I.3, Figure I.5.
### Task 6: Institutional analysis

**Main questions:** What are the characteristics of the existing environmental management institutions and the decision-making process? What support is needed so that the defined strategy can be implemented?

**Description**

This task first establishes the institutional baseline for environmental management (EM). It looks at the actors, organisations and institutions responsible for EM. The analysis focuses at institutions operating at scale level X+1 or beyond where ecological processes determining resilience operate. Analysis of the institutional baseline shows what capacities and resources are available (the supply side). The demand side can be determined on the basis of the defined strategy (task 4), including desirable EM functions, instruments and organisational arrangements. Matching demand and supply gives current gaps in terms of competencies, resources, partnerships, etc.. Particular attention should be given to management of common property resources and key actors involved in illegal resource-use.

**Emotions driver**

- What organisations show responsibility for EM? What are recent EM successes and failures? What indigenous management structures and practices exist?
- Are you satisfied about the decision-making processes dealing with environmental issues? Do you feel involved? Have you been able to participate actively?
- What support do we need? What are urgent needs (knowledge, resources, …)?
- What tactics can be applied to involve actors or institutions that are not cooperative? What are effective EM instruments to do so?

**Rational-analytical driver**

- Of relevant institutions at level X+1, what are their strengths, weaknesses, opportunities and threats, in the context of governance?
- What functions and instruments are needed to realise the defined strategy?
- What key actors and institutions must be involved, at different levels and sectors?
- What support is needed for these institutions (knowledge, resources, capacities, etc.)?
- How can we link up with decentralisation and devolution processes?

**Examples of early actions**

- Make an inventory of existing EM platforms, networks, co-management arrangements, etc. Draw lessons and expand good experiences.
- Make informal agreements on collaboration with private sector key actors, define mutual tasks and responsibilities.
- Celebrate EM successes, invite relevant actors and institutions.
- Organise and mobilise interested parties to undertake concrete actions. Involve the public.
- Organise small co-financed non-political actions and find out who are reliable partners.

**Desirable outputs**

- Overview of all actors, organisations and institutions that play a role in EM
- Their current EM functions, experience with EM instruments, strengths and weaknesses
- Desirable organisational arrangements to implement the strategy, with assigned functions and instruments to use (different levels and sectors), see Box 7.5
- Agreements (formal or informal) or contracts with key actors and institutions, to implement (parts of) the defined strategy.
Box 7.5 Checklist of relevant outcomes of institutional analysis for environmental management (EM)

- Categories of societal organisations to be involved in EM, from public sector, private sector and civil society
- Overview of EM functions performed and required
- Different levels involved, national and decentralised, and institutional functions: constitutional, management and operational
- Attribution of EM functions to different categories and levels
- EM instruments to be applied
- Organisational arrangements between different categories

Useful tools and connections to previous Chapters:
- Background to environmental management models, Section 4.1
- EM function see Table 4.1, EM instruments see Table 4.2
- Framework for analysis of EM institutions and its context, Section 4.4, Figure 4.4
- Levels of institutional functions and organisational arrangements, Section 4.2.2, Table 4.5
- Examples of organisational arrangements, co-management and integrated environmental management, Section 5.4
Task 7: Towards environmental governance

Main questions: What institutional model for environmental management do we want? So what is the long-term focus of institutional support?

| Description | Environmental management (EM) systems and the institutions involved show gradual changes, and tend to evolve towards a model referred to as Environmental Governance (EG). EG sets the conditions and an enabling context for management institutions to operate. When and at what pace this evolution will take place depends upon the governance and institutional context. It is important that, apart from defining short-term institutional support to implement the defined strategy, there is a vision about the desirable environmental management and governance system. To manage complex systems, the concept of resilience should be mirrored within the involved institutions. Key attributes for resilient (adaptive) management are organisational learning, responsiveness to contextual changes and societal demands through monitoring and early warning systems.
|
| **Emotions driver** | How do you think institutions responsible for EM should change to play their role in a better way? What would be your priorities?  
- How would you like to be involved in EM? What can you offer?  
- Are responsible institutions learning, or are the same mistakes made over and again? What could be done to avoid this?  
- Do you want more rules and regulations? If yes, who should design and enforce them? If not, what are concrete alternatives for illegal resource-use? |
| **Rational-analytical driver** | What is the prevailing system of environmental management (conventional, transitional or strategic)? What are chances of a desirable evolution?  
- How can environmental management and governance be strengthened on priority criteria?  
- What are key attributes of resilient / adaptive management? How can institutions develop these attributes? |
| **Examples of early actions** | Bring together stakeholders to discuss what environmental governance should imply  
- Make an inventory of organisational arrangements for common property resources. Promote arrangements that seem to work  
- Analyse a concrete environmental event (e.g. disaster), and how EM institutions dealt with it. Discuss what improvements are desirable.  
- Think about practical solutions to continuing illegal resource use, propose these to Government. Propose better rules and regulations. |
| **Desirable outputs** | Self-evaluation by EM institutions to assess their performance, actions for improvement  
- Guidelines for knowledge management and learning within EM institutions, involving civil society and private sector  
- Agreement on the environmental governance model to develop; actions to move forward. |

Useful tools and connections to previous Chapters:  
- Background to environmental management models, Section 4.1  
- Environmental management institutions and governance: Section 4.2.2
## Task 8: Monitoring change

### Main questions:
What are critical indicators to monitor environmental change and institutional performance? Who is responsible to do so? How will the results be used to learn from, and adapt the strategy?

### Description
Monitoring the changes that take place, and the impacts of the undertaken activities, is essential for an adaptive management approach. Monitoring focuses at indicators associated with critical knots and levers. Monitoring results feed into learning processes to adjust strategies and gradually improve based on concrete experiences. Monitoring environmental changes and impacts is rarely done, because it does not generate tangible short-term results. Institutions often do not have the capacities and incentives to carry out monitoring. Ideally, monitoring is part of a participatory approach that actively involves stakeholders. One should also set-up an early warning system, to be able to rapidly respond to unexpected threats and opportunities. A good early warning system largely depends upon a good network and excellent communication.

### Emotions driver
- How do you keep track of important changes in your surrounding environment? What are good sources of information, and reliable informants?
- What are critical signs or indicators of environmental changes?
- How can you be informed in time about possible environmental risks?
- Who should be responsible to inform you about environmental changes and risks?
- Who monitors whether institutions and key actors play their role as expected?

### Rational-analytical driver
- What is the prevailing system of environmental monitoring? Who is responsible, how is it organised?
- What are critical state, pressure and response indicators, as based on the situational and macro-level analysis (see Box 7.5)?
- What are good indicators to monitor institutional change (see Box 7.6)?
- What methods to apply to monitor the selected indicators? Who are responsible? How will results be analysed and used to adjust strategies?

### Examples of early actions
- Bring together stakeholders to discuss critical signs and indicators of environmental change. Jointly undertake some monitoring activities.
- Set-up a small network for early warning on environmental values and risks and illegal resource-use, e.g. water quality, forest exploitation, hunting, waste dumping, etc.
- Check journals and other sources of information on emerging threats and new opportunities.
- Keep records of important environmental changes (e.g. storms, poor yields, tree production, etc.).

### Desirable outputs
- System for environmental monitoring, with selected state, pressure and response indicators, methods and responsibilities
- System for monitoring performance of EM institutions
- Network and agreements for an early warning system
- Institutional requirements for environmental monitoring, tasks, capacities and incentives
Box 7.6 Different categories of indicators

Environmental state, pressure and response indicators

- **State or quality indicators:** reflect the condition of the environment, have direct linkages with environmental qualities to be monitored
- **Pressure indicators:** reflect the pressures by human activities, have indirect linkages with environmental qualities to be monitored. There are:
  - direct environmental pressure indicators
  - indirect environmental pressure indicators
  - indirect indicators in the field of politics, economics, social change
- **Response indicators:** reflect the human response measures to environmental problems.

Institutional performance indicators

- **Strategic planning** (e.g. use of planning tools, level of participation, long-term focus);
- **Mandate, mission or organisation** (e.g. transparency of vision, niche of organisation);
- **Profile of the organisation** (e.g. credibility, innovation, leadership, decentralisation, transparency);
- **Human resources** (e.g. skills, training, personal learning, staff continuity);
- **Communication and learning** (e.g. organisational learning, awareness raising, training);
- **Informational resources** (e.g. access to information, data generation, reliability);
- **Financial resources** (e.g. dependency on external funding, fund raising schemes);
- **Technological resources** (e.g. ICT facilities, multimedia facilities);
- **Delivering services** (e.g. level of satisfaction of target groups, monitoring system, conservation impacts, diversity of services, policy impacts).

Useful tools and connections to previous chapters:
- Monitoring as important element of adaptive management (Section 2.5; Section 5.3.3; Section 6.5).
7.3 PRINCIPLES AND GUIDELINES FOR THE PLANNING PROCESS

7.3.1 EIGHT PRINCIPLES

The planning process (HOW) is as important as the planning substance (WHAT), i.e. the framework that was presented for dealing with the planning substance. The planning process should meet criteria of sound decision-making to generate commitment to apply the resulting strategy. Insight in the characteristics of a planning process was acquired in Chapters 4 and 5, with more empirical evidence in Chapter 6. On the basis of reviews in these chapters targets and success principles and criteria for a good planning process were defined (see Section 5.5.1, Table 5.6). Many of these are by now generally accepted (like participation, multi-disciplinarity, transparency, ..).

In this section I aim to formulate and briefly describe principles and associated guidelines that are critical for a good planning process that effectively deals with complex environmental problems and sustainability issues.

The eight principles that were identified can be summarised as follows:

1. *Functional participation:* Participation should be designed as a functional means to attain development goals of the planning process.
2. *A clear demand:* Support to integrate environmental sustainability issues into a planning process should be based on a concrete demand from one or more stakeholders.
3. *Participation of victims and absent stakeholders:* Absent stakeholders and victims of present and future expected environmental problems should have a say in the planning process.
4. *Room for the three ERA drivers:* The design of the planning process, and the methods and tools to use should stimulate the three ERA drivers (emotions, rationality and early actions).
5. *Guided adaptive management:* The planning process and outputs should enable and stimulate a ‘guided adaptive management’ approach.
6. *Progressive contextualisation:* To be efficient and strike a balance between being comprehensive and detailed, the approach of progressive contextualisation is useful.
7. *Building coalitions for change:* To initiate change in complex situations the planning process should help build up coalitions and empower stakeholders.
8. *Facilitating a self-assessment approach.* The role of facilitation should focus at stimulating a self-assessment approach, and ensuring sustainability is not lost out of sight.

7.3.2 DESCRIPTION OF EIGHT PROCESS PRINCIPLES

Following are more detailed descriptions of the eight principles.
1. Functional participation

*Principle 1: Participation should be designed as a functional means to attain development goals of the planning process.*

There is agreement on the need for participation in assessment and planning processes, to enhance ownership, influence decision-makers, stimulate collaboration and networking, activate actors involved, ensure institutional ‘rooting’ and raise awareness. This will eventually lead to (more) innovative action and desirable change. But in reality the balance is difficult to strike: sometimes participation only consists of informing stakeholders about outcomes, at other times it becomes an end by itself (instead of a means to meet objectives: section 5.4.2). Cooke and Kothari (2001) speak of a new tyranny, and argue that participation is often part of a process of modernisation based on Western norms. A participatory approach shifts responsibilities for the planning outcomes from the development agencies (who are only facilitators) to the participants. This should not be interpreted as not providing any guidance and leaving all decisions to be taken to the participants, as this may lead to unrealistic wish lists and a lack of coherence. Participants often need external support and new ideas.

Functional participation should be designed as a functional means to attain development goals of the planning process. Some critical elements are the following.

1. **Selective and well-prepared participation with respect to three aspects:**
   - The substance (what). It must be clear for what substantive elements of the planning process participation is required and can be functional. For many subjects use can be made of earlier participatory sessions. It is vital that any limiting conditions and the room for manoeuvre, e.g. existing policies or rules, are perfectly clear. Participation is often limited to short-term dilemmas and minor issues, while the ‘big issues’ remain hidden. The inverse should be done.
   - The process (how). It must be clear at what moments active involvement of stakeholders is required and can be functional. The first step (design of the planning process) and the last step (follow-up after the planning process) are commonly forgotten, whilst these are most important.
   - The participants (who). Functional participation refers to relevance of participation based on formal position, control of relevant resources, power position and stakes in the issue. In most cases involving all stakeholders is not functional.

2. **Trust as a basis for participation.** To ensure participation on an equal footing, there is need for a minimum of trust among participants and equal rights during the process. There should be no bias against certain types of participants. Problems of language, ethnicity and traditions (gender, leadership, casts) require particular attention. It is often better to have a cascade of interactive sessions and social enquiries, than bringing together stakeholders with very different levels of power or background. Joint actions (e.g. joint fact finding, joint monitoring) can be highly instrumental build up trust, as a sub-objective of the planning process itself.

3. **Understanding of critical terms and concepts.** This is necessary to avoid confusion and a waste of time when dealing with complex problems where different disciplines and sectors are involved. Terms and concepts to define are from the environmental sciences (e.g. environmental function, resilience, sustainable development, underlying factor / root cause, etc.) and from planning science (e.g. criterion, goal, indicator, norm, principle, value, vision). Consensus is not the aim, but mutual agreement on working definitions.
2. A clear demand

*Principle 2: Support to integrate environmental sustainability issues into a planning process should be based on a concrete demand from one or more stakeholders*

A clear demand for support from the national or local level is required to ensure ownership of the planning process and its results. It can be a person or an organisation (the ‘owner’) with local responsibilities (e.g. mayor, environmental committee), usually at regional level. The owner should be willing to coordinate the planning process and consider it as part of a broader process of change, including his / her own organisation or institutional setting. The owner should be a legitimate and accountable person or structure. A clear demand depends upon several factors:

1. **Linkage to an ongoing planning process.** This refers to the necessary linkage of SEAN-ERA with an existing policy formulation process or planning cycle. It is not good to have parallel planning processes. A good moment can be when a new mayor has been elected, a new sectoral policy is formulated or a new strategy is being developed.

2. **An enabling legal / institutional / political setting.** This refers to progress of decentralisation:
   • A decentralisation act is being implemented, with established democratic procedures for elections and a clear mandate for local government to develop their own (strategic) plans
   • Local government has its own financial means, from central government and through local taxes, to fund at least part of the plans with own funds
   • There is devolution of line ministries, so that sectoral agencies are primarily accountable to local government (and the agreed-upon plans established at that level).

3. **A minimum of environmental awareness and sense of urgency.** The following factors can help generate such awareness:
   • Environmental education and information supply (e.g. by donors)
   • Pressure from donors or national agencies to comply to laws, standards, or treaties
   • Natural catastrophes (e.g. floods following a hurricane if forests have been cleared)
   • Health impacts from poor environmental management (e.g. excessive use of pesticides)
   • A strong dependency of livelihoods on natural resources (e.g. communities in remote areas)
   • Opportunities for better environmental management (e.g. incomes from organic products).

4. **Positive expectations.** Stakeholders should feel that by interactive planning, and use of the planning framework, the situation can be improved with mutual benefits (Section 5.3.3). It is important that key actors such as influential private sector and policy makers also see benefits from participating; they can be pushed to participate by lobby, public pressure, etc..

5. **Technical support, financial resources and time.** There is need for facilitation on strategic planning and environmental expertise. Some financial resources are required for workshops, studies, reporting, technical backstopping, etc. The time required for a planning process depends upon what has been done before, but a good planning process takes time.
3. Participation by victims and absent stakeholders

*Principle 3: Absent stakeholders and victims of present and future expected environmental problems should have a say in the planning process.*

Many current environmental problems are characterised by the trade-off of impacts over large distances (e.g. global trade) and over long time periods (e.g. cumulative impacts perceived in next generations). These victims of current resource-use are often absent in planning and decision-making on environmental management issues. These so-called ‘absent stakeholders’ include:

1. Minority, poor or marginalised actors (who cannot actively participate or present their views)
2. Actors affected at a large distance (e.g. island communities affected by climate change)
3. Future generations
4. The intrinsic values of nature and biodiversity.

In some way their views should be represented. How can this be done?

- **Physical presence.** This is possible for categories 1 and 2: for instance people from an island in the Pacific Ocean (in view of climate change), or people from a forest community in the Amazon area (in view of deforestation for timber) can participate physically when dealing with the problem of global climate change. In practice this will rarely occur because of transport costs and communication barriers. New ICT tools offer possibilities for communication at distance, but physical exchange has much more impact.

- **Direct representation.** Again, this is confined to categories 1 and 2: associated with the previous examples one would invite the mayor or local leader. This might raise questions about good leadership, accountability and legitimacy.

- **Indirect representation.** This relates to all categories. One can think of NGOs, CBOs, interest groups, cooperatives, etc. Again, these groups might not be sufficiently accountable and express their own views and interests instead of those whom they represent.

- **The normative observer.** This is someone who aims to take an independent position and represent the interests of absent stakeholders based on ethical and universal values and norms (e.g. human rights). It refers to the critical role of an external agency in participatory processes, to support and empower people as actors to make their own decisions.
4. Room for the three ERA drivers

**Principle 4: The design of the planning process, and the methods and tools to use should stimulate the three ERA drivers (emotions, rationality and early actions).**

The three ERA drivers were introduced and defined in Section 7.1. Synergy between the three drivers is indispensable; if one is missing or coherence between the three drivers is poor, desirable change will be difficult to achieve or to sustain. Yet, in practice the emphasis might be on one of the three ERA drivers; there might be different styles of planning process, depending upon which of the three ERA drivers ‘has the lead’:

- An E-style planning process, with much room for emotions. This could be useful when much rational-type planning has been carried out, excellent plans are available, but people do not feel committed or not taken seriously, or conflicts have not been adequately dealt with.

- An R-style of planning process, with much room for rationality. This could be useful when much experimental probing and social action has been carried out, but coherence and consistency is missing. Rationality is useful for a critical review and consolidation and strategic planning.

- An A-style of planning process, with much room for early actions. This could be useful when there are clear and obvious ‘small wins’ (which need no analysis or debate because they are obviously good). Also, early actions can be a good start-up to experiment on innovative ideas, or acquire confidence among a diverse group of stakeholders (joint actions).

In practice, there will always be a mixture of these three styles, to assure that ultimately all three have been adequately involved. Emphasis and sequencing will depend upon what has been done before (history), the prevailing context and the planning objectives to be met. For instance, if through an E-style approach the issue has been put on the public agenda, an R-style might be required to get it on the political agenda, or an A-style is required to put pressure on key actors and forge a break-through.

Mechanisms to stimulate the three ERA drivers include selection of:

- **Methods and tools.** System-analytical tools and methods (neo-classical planning) are useful to support the R-style, process-analytical tools and methods (learning, communication and negotiation) are useful for the E-style (Section 5.5.1). Early actions require ‘simple’ operational planning and should not be too complicated in nature (A-style).

- **Type of participants.** The three ERA drivers correspond to three types of human personalities, according to the enneagram classification (Rohr and Ebert, 2000). The basis of the different personality types is the relative importance of rationality (head), emotions (heart) and action-orientedness (stomach). The three planning styles would benefit from the presence of different personalities, with certain ‘talents’ for these styles among participants. Put in another way: a rational type of personality would not be very useful, and would feel uncomfortable, during an E- or A-style planning process.
5. Guided adaptive management

Principle 5: The planning process and outputs should enable and stimulate a ‘guided adaptive management’ approach.

An adaptive management approach is appropriate for managing complex ecological and social systems. Adaptive management refers to resilient, diverse and redundant regulation, monitoring that leads to corrective action and experimental probing of the continually changing reality of the external world. Key attributes for adaptive management systems are careful and limited steering instead of controlling, organisational (double-loop) learning and a high responsiveness to contextual changes and societal demands through monitoring and early warning systems (Fig. 2.13).

Adaptive management regards management policies or strategies as ‘experiments’. The emphasis is on learning from these experiments to adjust actions (at operational level). But to guide adaptive management that aims to contribute to sustainable development there is need for agreement on basic values, bottom-line standards and a vision, to determine which experiments are useful and which are not. These are both essential elements of what I would call ‘guided adaptive management’ (Section 2.5). It also implies applying the precautionary principle where uncertainties remain.

What are outputs of the planning process to support a guided adaptive management approach?
1. A vision: a desirable future situation based on insights about the locality in its macro-context
2. Strategic orientation: paths to bridge the gap between the present and the desirable future, with targets, some direct actions based on opportunities, and indicators for monitoring
3. Management principles: social and environmental principles or bottom-line standards to be respected as ‘boundaries’ when implementing the strategy
4. Elements for institutional resilience for institutions to adopt an adaptive management approach: learning, subsidiarity, communication, monitoring and early warning, flexibility, diversity, polycentric organisational arrangements, action- and result-orientedness (see Table 6.2).

Figure 7.5 visualises the dynamics of guided adaptive management. Communication, learning, monitoring and early warning generate inputs to undertake experiments and actions when ‘windows of opportunity’ emerge. Opportunities include innovators, social action, change of perceptions, new markets, conflicts, etc. Detailed planning is only done when an opportunity has been identified.

![Figure 7.5: Planning and implementation in line with guided adaptive management principles](image-url)
6. Progressive contextualisation

**Principle 6: To be efficient and strike a balance between being comprehensive and detailed, the approach of progressive contextualisation is useful.**

One challenge of strategic planning processes is to strike a balance between being comprehensive and all-inclusive, and being detailed on specific subjects. The challenge is to grasp the larger picture (being holistic and inductive), and then to concentrate upon key components and linkages and become practical (being focused and deductive). Mitchell (2002) proposes a blend of comprehensive and focused approaches, referred to as a mixed scanning approach.

In applying the SEAN method this problem was dealt with by using the approach of progressive contextualisation which is associated with the Problem-in-Context model (Section 2.4). Instead of analysing biophysical systems (as ecologists like to do) or political-economic systems (as sociologists like to do), the process is one of gradually building up insight on interconnections, largely through a causal chain approach that has a broader application than a systems approach. It helps build up insight in the network of contextual factors and associated actors, in relation to a well-defined problem (Figure 2.12). During the process of progressive contextualisation one gradually finds the knots and levers in the causal chains, and related to that solutions and promising actions. This process could stop when causes or solutions have been identified that are realistic. But to identify solutions of long-term sustainability relevance, it is important to continue the process until one scale level higher (level X+1) and one time horizon further (time horizon Y+1) than the direct interests. This difference could be referred to as the ‘sustainability relevance’ as compared to the ‘solution relevance’.

The approach of progressive contextualisation could be applied as a quick scan for planners to have quick results (as compared to system-analytical studies). An interactive quick scan may consist of a combination of proposed and prepared inputs and alternatives, and interactive moments whereby participants identify knots and levers, take decisions or propose adjustments (Enserink et al., 1997). Stakeholder knowledge and experiences are used at different stages to enrich and adjust proposals. One can see the possible connection with the ERA drivers feeding into a quick scan approach.

As key intervention areas are identified, one can start early actions along the lines of linear operational planning. These are like areas of order within a larger complex system. One learns from these for purposes of replication and feed-back to the larger system, as part of an adaptive approach. The other way round, a series of actions and experiences may gradually lead to a pattern or insights that can be used for adjusting the vision and strategy. This refers to a strategy as ‘a pattern in a stream of actions’ (Section 4.3.4).

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1. One argument is that a few factors cause a large proportion of variation, and most planners are satisfied if they understand the factors that cause 75-80% of the variability (Mitchell, 2002).

2. This can be done by actually physically moving from actor to actor along the causal chain, as exemplified for the problem of deforestation in Cameroon (Toornstra et al., 1994). One can also start out from an event, current change or proposed intervention, and from there on construct the biophysical and social chains of causes and effects leading to these events or changes (Vayda and Walters, 1999).
7. Building coalitions for change

Principle 7: To initiate change in complex situations the planning process should help build up coalitions and empower stakeholders.

There are doubts whether the current ‘family’ of goal-oriented planning and assessment methods can lead to real change, as some would like to see happening. While some argue that an interactive approach is not useful where radical change is required (Margerum, 1999), others state that even so-called revolutions consist of a series of small ‘wins’ and this is therefore what one should aim for (Weick and Westley, 1999). Many of the current environmental problems have a global dimension and are characterised by ‘basins of attracting’, i.e. persistent modes of behaviour that are difficult to change as they are related to socio-cultural and consumption patterns and belief systems. How can a planning process achieve effective change in such cases?

One element is the building of coalitions or constituencies to confront powerful actors and constituencies, with vested interests, which often obstruct available solutions for complex problems. North-south coalitions, involving victims and change agents, can be effective, assuming that existing powers are not too repressive. The planning process should help build up such coalitions. Even if the planning process does not result in any concrete action, it can be justified by effectively contributing to organise and empower potential beneficiaries of change. If these coalitions sustain this is also a concrete result of the planning process. Communication, negotiation and interaction will help organise stakeholders, at different levels, forming power structures leading to more effective and innovative action (Section 5.3.3). The three ERA drivers will be important to achieve such a result.

To achieve change in complex and persistent problem areas, other suggestions are:

- An effective use of collaborative management modes, supported by different tools and planning styles. Co-management is useful for two key actors to negotiate and agree upon concrete tasks and shared responsibilities for a certain sector or resource, to tackle an urgent and well-defined environmental problem. Integrated environmental management is useful to build up and maintain mutual trust and transparency among all actors involved, and agree upon a vision, strategy, management principles etc, constituting the framework within which more detailed management arrangements can be made (Table 5.6, Fig. 5.9).
- Addressing root causes of environmental problems. Root causes are generally of political, (macro-) economic, socio-cultural and institutional nature, within various sectors. Root causes and key actors are often found at supralocal levels. To change powerful key actors there is need to put key actors under pressure by lobby work, propose alternative options based on good studies, and raise public and political awareness (see case study in the Annex I.3).
- Responsiveness to social dynamics and public awareness. One should make use of existing opportunities and ‘windows of opportunity’ before inventing solutions. This also includes working with innovators and change agents, in stead of slow bureaucrats and decision-makers.
- Using a synergy of different instruments. A useful mix is that of command and control (law enforcement), market-based and engaging the public instruments (see Chapter 4, table 4.2). Synergy implies coordinated, focused and sequential.
8. Facilitating a self-assessment approach

*Principle 8: The role of facilitation should focus at stimulating a self-assessment approach, and ensuring that sustainability is not lost out of sight.*

The review in Chapter 5 demonstrated the critical importance of a good process facilitator for application of interactive planning methods, with different possible tasks to execute and roles to play (Section 5.5.1). In a general sense the role of the facilitator should be limited to a minimum. Self-assessments within groups appear to be particularly effective, to gain insights and define one’s own vision, values and norms, and development priorities. Self-assessments are good to build up confidence within the group and a sense of ownership. The facilitator should have a perfect knowledge of the various methods and tools that exist, but only apply these when the need arises. Symbolically, the facilitator should have a box with hidden tools, but only use these when the need arises. This includes a range of self-assessment tools and methods.

But the facilitator does have a critical role to play in assuring that during the process attention is given to sustainability issues. This requires the following tasks:

- Networking: organising distance communication or preferably physical exchange and meetings between different stakeholders, including far-off victims of current environmental problems
- Spokesman of absent stakeholders: where this is not possible, assuring that interests of absent stakeholders are considered (future generations, outside communities, nature values)
- Change leader: stimulating the participants to plan and push for real change, apart from small wins, by stimulating, organising exchange visits, showing synergy, proposing tactics, etc.
- Manager: assuring that participants move from ‘here and now’ to ‘there and later’, i.e. develop a long-term and large-scale scope of the planning process where possible
- Normative observer: helping set and respect sustainability standards and norms (environmental, good governance, social equity)
- Lobbyist: building bridges between parties, informing policy makers and other actors causing environmental problems, communicating with adverse parties.
7.4 INNER SENSES FOR SUSTAINABILITY

7.4.1 THE CORE LAYER OF HUMAN PERSONALITY

I identified emotions, rationality and early actions as important drivers to ensure that the planning process will make a difference in tackling complex environmental problems and supporting more sustainable development processes. Yet, even where this will be realised doubts may still exist on whether such change will be substantial and will sustain. Will people and institutions be able to overcome fundamental bottlenecks such as cultural predispositions, belief systems, lifestyles, consumption patterns and a short-term economic focus? It appears that national environmental agencies are not always reliable in safeguarding environmental values and standards; but will decentralised agencies or environmental NGOs be more reliable (Section 5.4.4)? And what about polycentric organisational arrangements (Section 4.2.2), will these be more consistent even if we are still dealing with the same people and organisations? In adaptive complex systems terminology, the current development system and paradigm retains a strong attraction, the escape from which requires particular efforts (Section 2.2.1, Figure 2.2). Why is this so difficult, and what is needed in addition to help achieve more fundamental change in situations of unsustainable resource use?

So far in this book I have dealt with underlying factors and root causes of environmental problems in the ‘outside’ world, i.e. in the world shaped by human beings. I did not deal with underlying factors and root causes within human beings. Yet, these determine how the outside world is defined and organised, and can therefore be considered as fundamental. Here, we touch upon the nature of human beings, why they behave and act as they do, how and why they assign values and norms, create organisations and institutions and take decisions that are or are not environmentally sustainable. In social and philosophical literature, we can find reference to underlying causes linked to the inner psychology of human being. Box 7.7 gives an example. It seems useful to structure these factors, to identify the most fundamental ones. A first attempt to do so was already made in Section 2.4.3.

In order to further explore inner drivers of human beings, I was inspired by the book on spiritual intelligence by Zohar and Marshall (2000). They discern three layers of personality, which could be visualised as three circles: the outer layer of consciousness and rationality, the middle layer of emotions and the unconscious, and an inner core layer (Figure 7.6). The outer layer is that of rational intelligence and storage of information. The middle layer consists of emotions, associations, neuroses etc., such as human greed, hastiness, mimicry, sense of freedom, discipline and creativity. Here one can find the main characteristics of different personality types.

Box 7.7: Root causes of environmental problems

De Geus (1993) identified factors responsible for the fact that environmental problems are so difficult to control:

- The push for economic growth, consumption, neglect of non-economic environmental and social values;
- The interest mechanism, which forces investors and producers to continue growing and producing;
- Collective behaviour characterised by personal interests (calculating individuals, free riders);
- Endless consumptive desires and the tendency to be seduced by others, to mimic and copy others (mimetic desires);
- The mechanism of negation, the capacity to neglect a future problem if its effects are not perceived;
- The shifting mechanism, meaning that responsibilities for complex problems are shifted to others (the ‘blame game’);
- The fear to change, and for the unknown;
- The rigidity of institutions, which appear difficult to change and adjust to changing contexts.
Conceptually, spiritual intelligence is situated in the inner-most layer. Basically, it provides the motives for acting. It includes core values such as religious senses, ethics, belief systems, sense of self, cosmovision, fear for death and the unknown, nature vision, love, etc.

What is the value of the inner most layer? Zohar and Marshall (2000) remark that many people in spite of being intelligent, rich, socially comfortable, etc. are often unhappy, and owe this to the absence of a well-developed spiritual intelligence. They consider as characteristics of a well-developed spiritual intelligence such properties as: capacity to be flexible, high degree of consciousness, sense of own identity, capacity to deal with human suffering, holistic thinking, a search for fundamental human values, philosophical questions, etc. Spiritual intelligence provides coherence, wholeness and structure; it is the integrating and ordering principle for the two other layers. People with a strong spiritual intelligence have an inspiring personality and feel driven by a vision with ethical values and norms of general validity. They often feel connected to a collective consciousness, which gives each personality a sense of being rooted within a greater stream of life. This enables them to better deal with uncertainties; it provides resilience and capacity to cope with change. Spiritual intelligence is not necessarily related to religion, but a sense of religion is one element.

The idea of these three layers originates from various sources that include Greek mythology, Western psychology (e.g. Jung) and Asian religion (Buddhism and Hinduism). Terms associated with this core layer are: unity, order, organisation, wholeness, balance, integration and totality. Jung refers to the core layer as the one where the archetypes are found. In popular psychology books about love, marriage, religion and human relations (which I will not attempt to summarise) a range of other terms is used to characterise this core layer of human personality: being, existence, heart, nature, source of energy, centre, original state, love, pureness, God. I will refer to it from here on as ‘inner nature’, as compared to the outer and middle layer which together are often referred to as ‘one’s personal ego’ (Fig. 7.6)

**7.4.2 THREE TYPES OF CONNECTEDNESS**

It is my conviction that one’s ‘inner nature’ is basically good. It is hardly imaginable, after all, that this inner layer could predominantly generate values and behaviour that would lead to the destruction of the very species that is so successful, in fact too successful, on earth. Logically a sense of sustainability is be part of the primary sense of ‘being good’. However, these inner senses might be hidden, poorly developed or degraded. While Jung supposes that one’s ‘inner nature’ develops only
as one grows to maturity, Kellert and Wilson (1993) suggest that love of nature is inborn in humans. This is part of the ‘biophilia’ hypothesis\(^3\). It is suggested that people may to a large extent ‘love nature’ for reasons of their own (psychological) well-being, but it is unlikely that enlightened self-interest covers everything that is biophilia. There is probably also a component of other-centredness, morally ‘true love’ one could say (De Groot, 2002).

However, these inborn elements of ‘inner nature’ might degrade, or get covered-up, by waves of rationality and emotions, starting with birth itself and subsequent experiences. In fact, I believe that this normally happens in Western culture. So there is need to revitalise the inner senses of one’s ‘inner nature’, which is not an insurmountable job because in essence these senses are already there\(^4\). In other words, revitalising, nourishing and maintaining this core layer of ‘inner nature’ leads to better ‘senses of sustainability’, which is needed to be able to apply long-term sustainability issues as defined during a SEAN-ERA planning process.

Effectively using the ERA drivers during a planning process, and during subsequent implementation and management processes, can help express capacities of the outer and middle layers of personality. These changes occur through information supply, gaining experience, social learning, collective action and inner reflection. It is a result of finding a harmony between the three types of logic: rationality, emotions and experience through early actions. The assumption is that emotions, as a more fundamental layer than rationality, may change if there is sufficient room for feed-back from rationality and early actions as part of a collective and personal learning process. This change will be a desirable and positive one, in line with sustainability goals, if during this process there is attention for sustainability issues, victims of environmental problems, etc.

But how may the foundations of ‘inner nature’ be influenced, revitalised, developed and nourished? I found different theories and ideas. Some emphasise the need for social relations, love, rituals, religion, social connectedness, etc. These theories usually have a Western psychological and humanistic or Christian religious background. Others emphasise the beauty of nature, pristine wilderness, tranquillity, nice landscapes, purity, etc. These theories usually have an environmental and romantic background. Yet others emphasise the need for inner reflection, meditation, self-healing, personality development, etc.; these theories usually have an Asiatic religious background reflected in New Age and modern psychological theories. The book on spiritual intelligence typically focuses on this third category: developing one’s spiritual intelligence is part of a process of ‘knowing yourself’ and overcoming an identity crisis.

I bring together these ideas and theories under the heading of connectedness, in three respects: with people, with nature, and with oneself (Figure 7.7). All three types of connectedness are essentially required to revitalise, nourish and maintain a ‘healthy’ capacity and quality of ‘one’s inner nature’, with ‘senses for sustainability’. Connectedness in three ways is required for these values to be felt, internalised and ‘lived through’, i.e. firmly rooted in one’s ‘inner nature’. It provides the capacity for people to take the right (sustainable) decisions because these ‘are good’ in a deeply felt way. It is different from a written ethical code, e.g. of companies, which are usually rooted in the ‘rationality’ layer of people, possibly with some emotional elements, but usually not in the core of ‘inner nature’.

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\(^3\) The essence of biophilia is the degree to which people acknowledge that nature has intrinsic value, i.e. value independent of nature’s usefulness (functions) for humans.

\(^4\) This links up to the insight of Zohar and Marshall (2000) who state that ‘spiritual intelligence’ can be developed at any moment in a human lifetime.
Figure 7.7: One's inner nature, its streams of inputs and its relation with social systems

The three types of connectedness can be elaborated some more as follows (Figure 7.7):

- Connectedness with people. Here one may think of love, family ties and friendship, but also of social networks, religious happenings, rituals, collective management practices.
- Connectedness with nature. Here one may think of experiences of being part of nature (‘oneness’), but also of extensive land-use practices (farming, herding, fishing, hunting), gardening, wilderness experience, care for animals, landscape experiences.
- Connectedness with oneself. Here one may think of self-reflection and meditation, but also of artistic creations (poetry, painting, …) and personality development.

The senses for sustainability associated with a well-developed ‘inner nature’ have more general validity than social rules and agreements (e.g. for environmental management). While social rules and agreements are required to manage society, once agreed upon these tend to become rigid and formalised, because they become outdated and need to be adjusted to a changing context. On the other hand, a society cannot be practically managed on the basis of general ethical and spiritual values and norms. Thus, interaction between the two systems is required (Figure 7.7).

5 Note that religion literally means re-connect (re-ligare).
7.4.3 HUMAN RESILIENCE AND DIVERSITY AS FINAL VALUE

In Section 2.6, I introduced final values to characterise the three dimensions of sustainable development, and those for institutions as a supportive component. The final values which best characterise what is required for the core layer of human personality are ‘resilience’ and ‘diversity’.

A strong ‘inner nature’ will provide the individual with resilience to respond and adapt to external pressures and threats; it is part of being self-regulatory and autonomous. So I think that self-regulation will work best for individuals with a sufficient degree of connectedness with one’s social context, nature and oneself. This generates trust and a strong sense of being part of a greater whole or stream of life. But one should also gain experiences of how to deal with unexpected changes and uncertainties. This brings me to diversity. Diversity and variability in life are required to have the opportunity to gain useful experiences and acquire the capacity to cope with unexpected change. Strong connectedness in three ways as described will also provide such diversity, since social relations, nature and ecosystems, as well as one’s own nature are full of non-linear dynamics, unexpected events and surprises. We can only develop a capacity of resilience by being strongly connected, so that we undergo these dynamics and develop capacities to deal with these. To mention a few examples:

- Connectedness with people. Here one may think of birth and death, conflicts and love, power relations, poverty and wealth, …
- Connectedness with nature. Here one may think of events such as droughts, floods, earthquakes, but also unexpected beauty, rare sights of animals, a sunset, sounds and smells, encounters of the sublime\(^6\), …
- Connectedness with oneself. Here one may think of moments of depression, enthusiasm, passion, great mistakes and learning, distress, events like disease, new insights, inner revolutions, …

Diversity and variability including small shocks are good to develop a capacity of resilience and to keep the impacts of shocks manageable. I first found this idea in the interesting work of Geldof (2001). He refers to the concept of self-organised criticality, which means that people organise themselves in such a way that small acceptable impacts or damage occur frequently, but unacceptable large damage is kept to a minimum. Small floods cause some damage but keep people alert and resilient and avoid that they undertake measures that constitute risks for great calamities, such as building houses in flood plains (see also Section 2.5.1 for more background and an example from the Sahel region).

There are many links of the above reasoning with the adaptive cycle within ecosystems (Section 2.2.1, Figure 2.3), with its phases of reorganisation (innovation), exploitation (growth), conservation (production) and release (decline). The adaptive cycle, at any level, is how resilience operates. A broad stability domain within which the adaptive cycle operates without flipping to another state or structure, is an indication of high resilience. In the absence of small shocks the system will become brittle and lose its capacity to reorganise, so becomes less resilient. This could be the case where there are too many rules and regulations, or services that demotivate people to develop their own capacities. These systems then become brittle with risks for major calamities in case of external shocks, because people loose their capacity of self-organisation and self-regulation, as well as creativity and autonomy. This could be referred to as the loss of resilience. It brings us back to the

\(^6\) The need to develop, nourish and maintain senses with nature, landscape and the earth is very well described by Lemaire (2002). Encounters with the sublime (usually as part of pristine nature) give strongest impressions on one’s senses.
beginning of this book, in Section 2.1.1, where natural behaviour was defined as behaviour that is self-regulatory and autonomous. Only now can we understand what this implies and why this is necessary.

One can see how three types of resilience fit into each other, and how resilience and self-regulation are cross-cutting key concepts for understanding sustainability. Resilient people are the necessary elements of resilient institutions, and resilient institutions are required for managing complex (ecological, social, economic) systems in such a way that their resilience is maintained, so that abrupt and irreversible changes can be avoided. Together, resilient people, resilient institutions and resilient (agro-) ecosystems constitute the core of sustainable development (Figure 7.8).

![Figure 7.8: Resilient people build resilient institutions; resilient institutions manage resilient (agro-)ecosystems; resilient (agro-)ecosystems nourish resilient people.](image-url)
Chapter 7 – SEAN-ERA: a framework and principles for sustainability planning

7.5 APPLICABILITY

The SEAN-ERA analytical framework and process principles are generic, and its applicability is scale-independent. It has a wide applicability, both in developing and industrialised countries, as a method to support planning (pro-active) or to support assessment (re-active), as a participatory process and as a quick scan, with a regional and/or a sectoral focus, open-ended or with a specific problem- or opportunity-oriented focus, as a formal method or an informal social enquiry and self-assessment. Based on this framework and principles, manuals may be produced that are specifically focused at certain sectors, regions, cultural settings, etc.

To give a few examples, the SEAN method (which is at the basis of the new SEAN-ERA framework and principles) has been successfully applied and adapted for the following purposes:

- Development of a strategic plan at municipality level;
- Development of a vision and strategy for environmental NGOs;
- Development of a regional strategic plan for sustainable development;
- A methodology for the strategic environmental assessment of poverty reduction strategy papers;
- A quick scan to develop a regional strategic plan for SNV;
- A method for integrated assessment and planning of sustainability, for design of environment-poverty-trade relevant policies, for the United Nations Environmental Programme (UNEP).

At this moment, good potentials to apply the SEAN-ERA framework and principles occur at decentralised level in developing countries, mainly in rural settings. Why is this so?

1. The high level of dependency on natural resources for daily living, so there is a sense of urgency concerning current environmental problems (natural resources management at the centre of sustainable livelihoods). There is a specific need to address increasing pressures on such areas as a result of globalisation, particularly where relatively rich natural resources are still available.
2. Decision-makers and key actors with direct management interests, sufficiently knowledgeable, committed and accountable (this does not mean that they have the right motivations, but they ‘know what they are talking about’).
3. Links to local governance and capacity building. There need for capacity building in strategic planning at decentralised levels. This also implies that the SEAN-ERA framework and principles can be applied under the heading of ‘capacity building’ or support to ‘local governance’.
4. The urgency of protecting local resources against global trade cycles. Local resources are being stripped as a result of driving forces operating at global level. There is need for local actors to set standards and prepare themselves.

Apart from this core type of application, what are other potentials for using SEAN-ERA? The following is meant as an indicative overview, and leads to a number of issues for further research and testing. I consider it as an agenda for future work on this theme.

1. Can SEAN-ERA be used for a more integrated assessment in terms of addressing the three sustainable development dimensions on an equal footing? Yes, this is quite possible. It would imply that for the social and economic dimensions in a similar way values, current dynamics, bottom-line standards and a vision are developed (see Figure 6.3). The challenge would be not to make the method more complex, by adding additional elements, but to focus at critical areas of integration.
2. Can SEAN-ERA be used for strategic planning in urban settings? Probably yes, but so far most experiences are in rural areas. While in rural areas in developing countries the emphasis is at ‘source’ environmental functions, in urban areas and industrialised countries the emphasis will be at ‘sink’ environmental functions. In a general sense, it will be important to address urban-rural relations; one cannot see urban areas without their rural context (for production, recreation, water supply, energy, etc. functions).

3. Can SEAN-ERA be used for zoning plans in the Netherlands? That would be a new type of application. So far, all applications have been in developing countries, where there are few existing plans, rules and regulations with respect to planning. In the Netherlands more attention will need to be given to the process, to the institutional and legal context and existing plans. Much rationality-based planning has been carried out. The emphasis will probably need to be at the emotions and early actions drivers. In some cases the need for change has been demonstrated several times, and undertaking early actions can be instrumental to achieve change. Powerful actors might need to be put under pressure by forming coalitions and including lobby-type of activities during the planning process.

4. Can SEAN-ERA be used to solve conflicts? Under the condition that conflicting parties are willing to communicate and negotiate, the framework is useful to find out the core of the conflict, and the core of mutual interests. This can be done by the logical sequence of tasks, from belief systems, values, norms and standards. This can create insight in different underlying belief systems. Likewise, the three ERA drivers are a useful starting point to find common understanding. Finally, the three layers of rationality, emotions and one’s ‘inner nature’ can be used to find common ground. It would be a major challenge to try this out.

5. Can SEAN-ERA be used to empower stakeholders? Here, at least the political context should allow stakeholders to come together and undertake a planning session as proposed. A common vision and strategy on how to tackle root causes and tactics to address key actors could be a possible and very useful result. NGOs are often poorly organised and undertake isolated activities without setting priorities and working in partnership. In that case, the emphasis could be at the tasks addressing institutional aspects, as part of an approach to develop effective organisational arrangements with adequate capacities to tackle key problems. More experiences need to be gained to adapt the framework to this type of application.

6. Can SEAN-ERA be used for a quick scan to acquire useful insight on what sustainable development at a certain locality? This is certainly possible, and has been done. However, in that case the process aspects are neglected, and one will have to do a thorough preparation to select good participants and have a balanced set of information. A combination of preparatory studies and participatory exchange can ensure that even with a quick scan the range of issues involved is adequately covered. The SEAN-ERA framework could also be used as an evaluative checklist, to verify whether the existing plans and policies have taken into account critical sustainability issues.
ANNEX I: STUDIES ON RESOURCE-USE DYNAMICS AT DIFFERENT LEVELS

In this Annex the empirical evidence is presented that has lead to the conceptual insights with respect to the substance of design, as part of a planning process that aims to take into account environmental sustainability issues. These conceptual insights are presented in chapter 3, with references to facts and conclusions from the case studies presented in this Annex.

Four sets of studies are presented, each associated with a common theme. Each theme and section is concluded by key lessons and elements relevant to the main objective of this book. Where possible, insights are derived with more general applicability, and patterns will be explored, for instance in terms of spatial (landscape) changes, and in terms of temporal processes of change.

Section I.1: Local management of common property resources
Here the emphasis is on local management practices with respect to common property grazing and forestry resources. The local practices are put in a context of regional dynamics. There are three case studies:
- Grazing systems and reserves in the Yemen Arab Republic
- The management of rangelands in the Sahel region in Western Africa
- The management of woody plants in the Sahel region in Western Africa

Section I.2: Regional agricultural land-use dynamics
Here the emphasis is on processes of land-use rehabilitation and agricultural intensification in relatively resource-poor environments. The case studies emphasise the regional scale level. There are three case studies, two of which summarise experiences from a range of different settings:
- Land rehabilitation in the Sahel region in Western Africa
- The potentials for Low External Input Sustainable Agriculture
- Land-use intensification in resource-poor environments

Section I.3. The forest conversion process in Indonesia
This case study at a regional level emphasises the relations between local level forest conversion and root causes and actors at higher levels. A spatial picture emerges that is illustrative for large-scale landscape changes. The case study also shows how strategic insights can be used to design concrete actions.

Section I.4. The influence of structural adjustment programmes on the environment
This analytical study from a range of countries emphasises the consequences of macro-economic policies at high levels for environmental and socio-economic well-being at regional and local level. Insight lead to conclusions with respect to processes operating at a macro scale.
I.1 LOCAL MANAGEMENT OF COMMON PROPERTY RESOURCES

I.1.1 GRAZING SYSTEMS AND RESERVES IN THE YEMEN ARAB REPUBLIC

Context and case study
In the Montane Plains, Yemen Arab Republic, rangelands unsuitable for cultivation occupy at least
50% of the land plains, located at 2300 m elevation, with rainfall varying from less than 200 to 600
mm annually. In the mixed farming system livestock (mainly sheep and goats) are kept alongside rain-
fed and irrigated crop cultivation. Rain-fed crop cultivation is made possible by water harvesting from
the rangelands, which is stimulated by removing shrubs and making small canals to accelerate water
flow to croplands. The rangelands are communally owned, per village, but catchment areas are
usually privately owned, as they are vital to cropland productivity. Soil fertility is relatively high,
through sheep herding and their manure the fertility of croplands is improved.

Sheep herding is a major source of local income, with fodder mainly obtained from extensive
rangelands. The rangelands and their vegetation are adapted to centuries of high grazing pressure, and
are extremely resilient. Dust turns into grasslands as soon as there is rain. However, the current state is
certainly sub-optimal in terms of species diversity (e.g. trees have disappeared) and vegetation cover.
Apart from the grazing, the rangelands perform various other environmental functions. These include
the supply of firewood, food and medicinal herbs (production functions), biodiversity, recharge of
groundwater supply, soil protection and water harvesting (regulation functions), religious sites,
landscape scenery and historical sites (signification functions). In addition, it seems that the
rangelands often constitute a buffer-zone between rival villages, precise boundaries are never given.

My case study focused on sheep herding practices, analysis of food intake and food supply from
rangelands and croplands (Kessler, 1989). The objective of the study was to gain insight in local sheep
herding practices in relation to rangeland dynamics, with the aim to identify interventions and
improved management practices with the potential to increase sheep productivity in a sustainable way.

Results
In the Yemen Montane Plains, sheep are grazed on the rangelands during daily trips that do not exceed
10-20 km distance. On an annual basis, sheep obtain 40% of their feed requirements from the
rangelands, 35% from cropland stubble and weeds, and the remaining 25% largely from crop residues
and fodder crops, including irrigated crops. Sheep herding shows distinct seasonal patterns,
characterised by grazing locations and feed resources. These seasonal patterns show a close
relationship with rainfall patterns, and can be explained by the variation in fodder supply (in quantity
and quality) resulting from that. As rainfall is highly variable and unpredictable, herding patterns are
also highly variable between years.

While the majority of the rangelands are communal grazing lands, accessible at any time of the
year, there are different types of grazing reserves (mahjur areas) with private and communal
ownership and restricted grazing rights. All mahjur areas represent a significantly higher biodiversity
than the surrounding communal rangelands. Some plant species were exclusively found in mahjur

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1 Common property resources can be defined as ‘jointly-owned private property without unilaterally tradable shares’. The group of co-owners must jointly agree about management activities, according to rules laid down by the group. It is different from jointly-owned private property (where individual co-owners may sell their shares without consulting co-owners), or common-pool or public property resources (McCay et al., 1999).

2 The ratio between the water catchment area (the impluvium) and the catchment area varies from 20 in dry areas with slight slopes to 5 in moist areas with strong slopes.
areas. These are mainly leguminous herbs with high feed quality. In view of the much higher plant biomass in mahjur areas, it can be expected that insects and reptiles are also more abundant.

Based on discussions with old villagers and a search in old Arabic texts, the management of mahjur grazing reserves could be reconstructed (Kessler, 1995). Mahjur areas are used as a forage reserve in the dry season for feeding sheep. There are small, privately owned, temporary closed mahjur areas, consisting of (part of) the slope from which run-off is concentrated on underlying croplands, primarily meant to protect crops against grazing and to reserve forage for private use. Secondly, there are permanent, privately owned mahjur areas, closed for communal grazing during the entire year. Thirdly, there are large, communally owned areas that are declared village mahjur area shortly after the onset of the rains, to be protected against grazing until the end of the dry season.

The variation in management of mahjur areas can be partly explained by variable ecological factors. To improve livestock production, mahjur areas may provide additional forage in terms of biomass and/or feeding values. There is an inverse relation between high biomass (in higher rainfall areas) and high feed quality (in low rainfall areas). Where rainfall is highest, mahjur areas have low quality pasture, like the surrounding communal pastures, but due to low grazing pressure generally have some high quality herbs as well, in niche habitats mainly. These herbs offer high quality feeds which can be critical in the dry season. Where rainfall is low and pasture production most unpredictable, forage from the mahjur areas has sufficiently high quality, even during the dry season. Here, biomass from large mahjur areas is of vital importance during the dry season. They are communally managed, contrary to those in higher rainfall areas.

Socio-cultural factors can help understand why some villages have mahjur areas and others not. First of all, it became clear that villages where mahjur areas were found were relatively well organised, had no internal disputes and relatively strong leadership (local sheikhs). The third category of large communal mahjur areas is particular; these areas appear to originate from land disputes between villages. Their mahjur status can be considered as a consensus on limited use for everyone concerned, and in many cases the Imam (national religious leader) personally legalised this status.

Dynamics
There is considerable variation in sheep herding practices between villages. This can be largely explained by variation in sheep numbers and the importance of irrigated croplands and fodder crops. One village represents the ‘traditional’ situation: a high sheep stocking rate, very limited irrigated croplands, and a high importance of sheep herding for income (meat and wool). Here all available feed resources are fully utilised during the year. It was estimated that the sheep stocking rate would exceed the carrying capacity in a dry year. Measures that were undertaken in that case include the use of mahjur grazing reserves, selling of sheep, migration of sheep flocks to more humid regions, and the purchase of supplementary feeds. The other village represents the ‘modern’ situation: a low sheep stocking rate and 45% of the croplands under irrigation, and livestock keeping increasingly limited to household needs. Here 30-50% of the feed availability is now left unused, rangelands are increasingly under-utilised and cash-crop production is concentrated on the most productive lands, which are also irrigated. Irrigation is made possible by the nearby valley (with relatively good soils and shallow ground-water), remittances from Saudi Arabia, improved accessibility and infrastructure, and private land ownership.

The mahjur areas increasingly become private or communal grazing land. Authorities or local communities are not anymore interested in their management as grazing reserves. From an ecological and economic perspective, crop residues from irrigated crops or fodder crops and imported supplementation feeds from other parts of the country are more attractive than time-consuming grazing in mahjur areas. However, more importantly, from a socio-cultural perspective, mahjur areas
are considered to be a remnant of ‘old-fashioned’ traditions, dating from the time of the Imam, which are inappropriate for a modern ‘democratic’ state. Moreover, their management by village leaders becomes increasingly difficult as communities open up, disintegrate (some benefiting from the modernisation, others not), and young people move to urban areas for work.

In some villages *mahjur* areas continue to be managed as grazing reserves. These are in general remote villages with little or no access to means to modernise (e.g. irrigation). These communities are willing to improve their rangelands by planting fodder shrubs and adopt rotational grazing.

**General insights**
The *mahjur* grazing reserve areas are a good example of the way sustainable use and biodiversity conservation goals may overlap. The importance of *mahjur* areas in the ‘traditional’ sheep production system constituted a safeguard for their sustainable management, based on the high dependency of livelihood systems on local natural resources and the underlying ecological regulation processes, including vegetation biodiversity linked to fodder quality. But *mahjur* areas have virtually no value in the ‘modern’ grazing system. Therefore these areas become available for other types of land-use, which may have positive impacts on biodiversity (nature conservation, tourism) or negative impacts. Unfortunately, the negative impacts prevail: irrigated cropping, mining or infrastructure development. A range of economic, political and socio-cultural factors determine which options are chosen.

The biodiversity status and management of *mahjur* areas are similar to those of the *hema* system found in Syria. The *hema* system broke down in the 1950’s with the government’s insistence that the rangelands were public property, but it has been reintroduced in the form of co-operatives with communal grazing rights (Draz, 1980).

Grazing reserves, to permit vegetation recovery or to reserve forage for dry periods with feed shortages, is part of a conservative type of rangeland management (Sandford, 1978), which suited the ecological conditions in the Montane Plains. The origins of *mahjur* areas and the recent evolution of land-use in the area, show the interplay of ecological, economic and socio-cultural factors. To reinstall *mahjur* areas, e.g. for environmental purposes, one would probably need to address key factors from each of these domains. Strong local leadership is a critical socio-cultural factor.

The two villages that were studied demonstrate the evolution from ‘traditional’ to ‘modern’, which is typical for mixed land-use in semi-arid areas (Ruthenberg, 1980). The evolution shows how livestock production systems become less dependent on natural factors (rainfall determining rangeland feed production) and more on fodder and crop residues from irrigated crop cultivation. This ‘modern’ situation is attractive to farmers as it is more productive and secure, and less labour intensive. It depends upon fodder produced in high rainfall areas and transported to the Montane Plains, or on crop residues and fodder crops produced in the area itself by using irrigation. However, irrigation is not sustainable as ground water reserves exploited for irrigation are limited and are expected to be depleted within decades. In addition, expensive pumps and petrol are required, making the system vulnerable to economic crisis. In the ‘modern’ village sheep herding on the rangelands becomes a ‘poor men’s job’, with herders often old men.
I.1.2 MANAGEMENT OF RANGLANDS IN THE SAHEL REGION IN WESTERN AFRICA

Context and case study

The ‘Sahel region’ in Western Africa is generally interpreted as including two climatic zones: the Sahel zone (average rainfall 150-600 mm) and the northern Sudan zone (average rainfall 600-900 mm). In this region one finds ‘transhumance’ pastoral systems with seasonal, relatively predictable movements of the Fulani pastoralists with their cattle covering large distances, and with fixed settlements. Animal productivity of the transhumant pastoralist system is comparable to that of extensive Australian cattle farms (Breman and De Wit, 1983). This demonstrated the efficiency of the highly mobile management system in the Sahel region, in contrast to widely held views. During the rainy season the transhumant livestock system makes use of the high quality pastures in the northern-most areas (with lowest rainfall); during the dry season they move south to make use of the higher water and forage availability in higher rainfall areas. Here semi-deciduous savanna forests predominate, with the occurrence of trypanosomiasis as a natural limitation to high grazing pressure. In an ecological sense the decision for pastoralists to move into higher rainfall areas is a trade-off between higher forage and water availability and the incidence of diseases.

In the Sahel region one finds mixed agro-silvo-pastoral land-use spatially organised around villages by concentric circles of different types of land-use (Fig. I.1). The rangelands occupy the outer circle, and are of different categories (Kessler and Wiersum, 1992):

- With a permanent status, because unsuitable for agricultural use, or its (legal) status for pastoral or forestry use (e.g. a village or state forest or livestock corridor)
- With a temporary status, seasonally not cropped, or fallow for several years to restore soil fertility, or abandoned croplands due to soil degradation.

These rangelands perform a range of different functions for different users: they provide fodder and fuelwood, construction wood, wild fruits, herbs and medicinal plants. Ecological regulation services include the provision of nutrients (through grazing and manure) to croplands, and water regulation through run-off, both of which are critical for cropping in the Sahel region.

The traditional interaction between pastoralists and farmers in cropland areas is characterised by so-called ‘manure contracts’. This is a symbiotic relationship where animals camp on harvested croplands, feeding on crop residues and in surrounding fallowlands and savanna rangeland areas, while manure is being provided in return. In addition products are traded, mainly milk and cereals. The system is basically an ecological linkage, with economical benefits for both parties (McCown et al., 1979). In similarity to many other common property management systems, this system is based on social reciprocities and solidarities, including agreements on management and user rights of different land-use types (Borrini-Feyerabend et al., 2000). One major change during recent decades is the increased settlement of Fulani pastoralists with their cattle herds, thus adopting a semi-sedentary pastoral system with settlements and a few croplands directly around their homesteads.

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3 This is justified as decline of average rainfall by 100 to 200 mm during recent decades would place the northern Sudan zone into the Sahel zone proper.

4 The indication of ‘suitable for arable cropping’ is subjective. As population pressure increases, sooner or later land may be cultivated which according to conventional soil capability assessments is ‘not arable’ (e.g. pockets in between rocks, sloping land and shallow soils). Obviously this is not sustainable.

5 In the region ‘Centre Nord’ in central Burkina Faso, almost 50% of the lands that were originally arable have thus been degraded, constituting about 20% of the rangeland (Van der Hoek et al., 1993).
Results
One such a semi-sedentary pastoral system was studied in southern Burkina Faso (De Boer and Kessler, 1994). The objective was to gain insight in the different land-use systems, to find ways of making pastoral and agricultural land-use more compatible and solving land-use conflicts. In the study area, semi-deciduous forests still cover more than 80% of the land area. Studies of the feeding habits of the cattle showed that on an annual basis at average 90% of feed requirements are obtained from the rangelands (24% annual grasses, 38% perennial grasses, 17% herbs and 12% browse from trees and shrubs) and 10% from crop residues. There is great seasonal variation related to rainfall patterns.

The local mobility of the herding strategies includes distances of up to 50 km from the homestead, which is considerably less than the ‘transhumant’ system. Local mobility was explained by the variable availability of limiting water and forage resources. During the early dry season, livestock are grazed on croplands with available crop residues, with advantages for farmers in providing manure. The crop residues have high feeding value, and are critical for livestock productivity. This was demonstrated by the major live-weight gains of cattle during that period. During the dry season herbs and browse from trees is important, but nevertheless weights of cattle will gradually drop, depending upon the length of the dry season. Water scarcity during the dry season forces herds to move to areas with permanent water points. These occur as lakes, dams and shallow wells, found in and around valleys and depressions, but are not common in the area. Pastures around these areas do not seem to be overgrazed, because Fulani do not permit animals to graze in the vicinity. At the end of the dry season, herd mobility focuses at finding the early growth of herbs and grasses, following scattered early rain-showers at specific locations.
Annex I  – Case studies on resource-use dynamics at different levels

**Dynamics**

The study also looked at the current dynamics and its underlying causes. First of all human population growth is high, at average about 5% between 1985 and 1991. This is mainly due to immigration by both Fulani pastoralists and Mossi farmers, moving from drought prone and densely occupied northern areas to higher rainfall savanna areas. There is a correlation between the incidence of drought and the rate of immigration. For both groups of migrants, the balance shifts due to the incidence of drought and land scarcity in the north, in relation to the disadvantages in the south (greater incidence of pests and weeds). The pattern of Fulani pastoralists moving southwards and settling in areas with relatively undisturbed vegetation and remaining forage resources is a common process in Sahel countries (e.g. in southern Mali: Leloup et al., 1996). The number of resident farmers also increases, due to population growth, contributing to increasing land scarcity. Due to Fulani immigration and farmers having increasing number of livestock, livestock pressure increased by an estimated 14% per year between 1975 and 1989. De Boer and Kessler (1994) found increasing indications for land scarcity, both for cropping (e.g. by the increasing number of croplands on slopes), and for grazing (e.g. by the decline of desirable forage species such as perennial grasses, and increasing damage to trees due to cutting for browse).

In a general sense, land-use dynamics in the Sahel region can be characterised by an increasing land scarcity, leading to a trend of both intensification and privatisation. Fallow periods become shorter, while fallowlands are more intensively utilised and privately owned by farmers, thus become less accessible to pastoralists. One main underlying reasons is that farmers have more livestock of their own, to produce manure and provide traction (FAO, 1996). Farmers sometimes deliberately clear land in such a way that only disconnected patches of grazing land remain, thus making Fulani pastoral land-use impossible. Farmers have an advantage because they can own the land, contrary to the pastoralists. As a result the number of conflicts between pastoralists and farmers increases, but farmers are often supported by the local political powers dominated by agricultural ethnic groups.

As a response to these problems, in some villages interesting initiatives appeared to manage land-use, such as agreements between pastoralists and villagers, generally based on good relations between certain village and pastoralist leaders. Agreements focused on the use of croplands and crop residues mainly (De Boer and Kessler, 1994). Most other initiatives focused at a local (farm) level (e.g. growing of fodder crops, improved use of cattle manure) and were strongly promoted by outsiders. These initiatives could form a starting point to develop a ‘land management plan’ for integrated agro-pastoral land-use (‘gestion de terroir’) based on a negotiation between pastoralists and local farmers.

**General insights**

The study demonstrates the highly adaptive characteristics of the Fulani livelihood system. As a result of drought and pressure on grazing resources in the northern Sahel zone they moved southwards into relatively unoccupied zones. This change is accompanied by major adaptations, such as that from pastoralism to a more semi-sedentary lifestyle, from large-scale transhumant mobility to small-scale mobility, as well as a change of herd composition (to more trypanosomiasis tolerant cattle breeds). This demonstrates the remarkable resilience of these pastoralist people.

The study also shows how a relatively scarcely populated region can be rapidly occupied due to spill-over from areas under pressure (partly due to the incidence of drought), and due to increasing livestock numbers by all residents. The semi-sedentary pastoral land-use system by the Fulani pastoralists can be characterised as extensive (space-consuming) and involves little or no deliberate management to improve the efficiency of the system. It is incompatible with the sedentary cropping system. For pastoralists the main objectives of having livestock is to produce milk and meat. This requires high quality feed resources, extensive rangeland areas, and large herds as a security against
drought events. By contrast, for farmers having cattle is mainly to produce manure and for animal traction. They are satisfied with smaller number of livestock, lower animal productivity and lower rangeland quality. Thus, as farmers with their livestock tend to overgraze the rangelands, these become unsuitable for pastoralist animal production goals.

These changes first of all lead to pressures on cropland and rangeland resources, causing social tensions and conflicts. The study also showed how local initiatives are being taken to overcome these problems. These should form the starting point for promising interventions, by supporting and strengthening these.

At a higher spatial and time scale, basically there are two alternative solution strategies to overcome increasing land pressure, for each of which examples can be found in the region:

- **Land-use integration.** This includes agreement on grazing and croplands at village level, and involves collaboration between pastoralists and farmers within village territories, and aims at regulating and optimising the interactions between the two land-use systems.

- **Segregation of land-use.** This includes pastoral areas, forest areas and intensified croplands. Land-use intensification requires the use of external inputs, and is feasible mainly for cash crops such as cotton. Pastoralists with their herds are excluded from high value croplands. Pastoral areas or reserves might be managed according to pastoral management goals, including large areas with relatively intact grazing resources, to maximise animal production goals. Fodder produced in intensified pasture areas might help maintain animal productivity in pastoral areas.

Which of these two options will ‘win’, depends upon a range of factors, including land tenure, market prices for crops, ethnic relations, political factors, and others.
I.1.3 MANAGEMENT OF WOODY PLANTS IN THE SAHEL REGION IN WESTERN AFRICA

Context and case study
Most agricultural fields in the Sahel region, as in most of semi-arid Sub-Saharan Africa, can be characterised as farmed parklands (Botta, 1999). Farmed parklands are defined as the dispersed presence of well-grown trees on cultivated and recently fallowed land (Fig. I.1). Farmed parklands develop as the cultivation period increases and cropping becomes more permanent. Canopy cover in farmed parklands averages from 5-15%, with variations mainly due to farmer attitudes toward trees on cultivated fields, tree species, crop characteristics and the period of cultivation. Tree species diversity is quite high (about 30 species have been recorded), and the trees perform various functions: they provide useful products (fruits, leaves as fodder, timber, fuelwood, medicinal products, material for handicrafts), shade (for people and animals). In addition, the trees perform various ecological functions, such as soil stabilisation, nutrient cycling and microclimate improvement.

While in most industrialised countries trees are generally considered to be incompatible with intensified cropping or grazing, agroforestry as a new science became recognised in the 1970s, because of environmental awareness of the ecological problems related to tree-less monocultures. The rationale for developing agroforestry was to obtain a higher, more diversified and/or more sustainable production of the tree and other agricultural and/or livestock resources than is possible with other types of land-use (Lundgren, 1982). The claim of increased and/or more sustainable agricultural production seems particularly attractive for developing countries. Here, agroforestry may be a ‘low external input’ technology to overcome soil fertility constraints mainly.

As a result, new agroforestry techniques were promoted, such as alley cropping, live hedges and wind breaks. This case study looked at the existing forest and tree management practices in the Sahel region, with the aim to determine their sustainability in comparison to new techniques, and to determine whether indigenous practices could be improved.

Results
The dominant trees in the farmed parklands are karité (Vitellaria paradoxa) and néré (Parkia biglobosa), with sorghum as the main cereal crop. Karité nuts are made into a paste and néré fruits are made into a highly nutritious and preferred spice; both products are marketed. It can be generally observed that crop yields under the canopies of these trees is lower than in the open field. One study investigated the interaction between trees and crops, both in ecological and in socio-economic terms (Kessler, 1992).

It appears that both soil fertility and soil moisture contents are better under the tree canopies than in the open field. However, during the growing season light intensities under the tree canopies are lower than in the open field. There is a significant correlation between sorghum yields and light intensity, suggesting that light availability, reduced to a minimum of 20% under the tree canopy, is the major factor responsible for lower crop yields under the tree canopies. Sorghum grain yields under tree canopies are thus reduced by 50-70%, in comparison with yields in the open field. In a farmed parkland with at average 10 large trees per hectare the reduction of sorghum yields due to shading would be about 6%. However, the monetary benefits to be obtained by transformation and marketing

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6 The famous Faidherbia albida tree sheds its leaves during the growing season, so that no shading effect occurs. On the contrary, now crops can benefit from the higher soil fertility under the tree canopy. However, this tree species requires a relatively fertile soil and access to groundwater resources. The effect of higher crop yields can also be observed under canopies of pruned trees, or at localities where recently a tree has been cut.
of the tree-products are about twice as high as the losses due to reduced sorghum yields. This seems to 
demonstrate the economic rationale of the existing system from the farmer's point of view.

Other surveys showed that farmers are generally aware of these interactions between trees and 
crops in parklands (Boffa, 1999), and take measures to manage these interactions for specific goals\textsuperscript{7}. 
But little is known of local management techniques of woody plants in semi-arid regions (Savenije, 
1993). Therefore, a second case study looked into the existence of indigenous tree management 
practices for néré trees in the Sahel region (Timmer et al., 1996). It was found that there is active 
generation of these trees by seeding or transplantation of young seedlings. Also, pruning occurs for 
10-30\% of néré trees in farmed parklands. The major reason for pruning was to rejuvenate branches 
and thus to increase fruit production and this mainly involved old trees\textsuperscript{8}. Pruning was more important 
on fields near villages than far away, apparently because trees near the village are privately owned and 
harvesting can be better controlled. Only few farmers mentioned the prevention of shade, to reduce 
crop yield reduction, as a motive for pruning. Apparently yield reduction by shade is not a major 
problem. In fact, shading by trees is also an opportunity, as it allows growing shade tolerant crops, 
such as hot peppers, which also contributes to crop diversification. Ringing is another management 
practice aimed to stimulate fruit production of néré trees (Wiersum and Slingerland, 1997).

Farmers stated that in the past, when tree density was higher and productivity better, pruning was 
generally oriented at wood exploitation and to reduce the incidence of falling branches and shade. The 
present condition of néré trees is poorer and pruning is mainly done to improve tree productivity and 
survival. Also, many villages have clear rules about tree felling on fields near the village. This 
suggests that local farmers’ tree management techniques take into consideration sustainability criteria, 
and are being adapted according to ecological changes. The study found evidence for a relation 
between the intensity of tree management practices (for certain species, or age categories) and the 
value of the tree products.

However, a major reason for not pruning was the fear of being fined by forestry agents. Officially, 
any pruning is prohibited. Therefore, pruning is nowadays often done secretly. Unfortunately, 
outsiders and state services often believe that indigenous management practices are irrational and only 
involve indiscriminate and opportunistic harvesting, rather than considering these as opportunities for 
further improvement\textsuperscript{9} (e.g. Arnold, 1998).

**Dynamics**

With respect to tree management, the following changes are apparent in the Sahel region:

1. As croplands are being cultivated more permanently, woody plant density generally declines, 
   probably because shrubs and young trees are continuously browsed and uprooted. This problem 
could be solved by keeping livestock in stables and stall-feeding.

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\textsuperscript{7} For instance, farmers in Western region, Zambia, explained how they use tree litter and ashes to particularly fertilise 
spots of poor crop growth, how they burn tree trunks to gradually release nutrients over the years, how certain tree species 
are retained because of their influence on soil fertility etc. (Kessler and Phiri, 1992).

\textsuperscript{8} The stimulating effects of pruning on fruit production are generally acknowledged, albeit under certain conditions 
(Cannell, 1991).

\textsuperscript{9} In semi-arid regions strict management rules, such as no burning, no grazing, no browsing or cutting of trees, do not 
make ecological sense. For instance, fire and grazing are agents that have a positive impact on ecosystem productivity and 
stoability, provided that their intensity and frequency are adapted to local conditions. A rigid prohibition of burning leads to 
uncontrolled fires and undesirable vegetation development. A moderate grazing pressure is beneficial for soil rehabilitation 
processes by opening up crusted soils, seed distribution and creating micro-patches with good conditions for seed germination 
(Hiernaux, 1992). Moderate levels of browsing or pruning of woody plants maintains productivity and resilience.
2. As cultivated crops become more valuable tree density generally declines, particularly in case of crops that are not shade tolerant (e.g. cotton, irrigated rice). This can be explained by the increasing costs of any yield reduction of cash crops due to shading by trees and root competition in comparison to the benefits of the trees. This problem could be partly solved by linear tree arrangements around fields.

3. As animal traction or mechanised ploughing is applied trees are increasingly removed because their roots hinder the ploughs (e.g. Ruthenberg, 1980). This problem can be solved by prudent ploughing or linear tree arrangements.

These changes suggest a general trend of declining woody plant densities on and around croplands in the process of agricultural intensification. Evidence from ‘green revolution’ areas in India support the view that tree cover declines in the process of agricultural intensification, as trees are not anymore required for ecological functions (nutrient inputs being obtained from external sources mainly), nor for subsistence needs (annual crops and off-farm activities yielding higher production levels and incomes, and cow dung being used as the main source of fuel instead of fuelwood) (Saxena, 1992).

In terms of forest cover in the Sahel, there is a continuous decline of forest cover and areas covered by natural forest. This is partly due to natural causes (drought), but the effects are exacerbated by human impacts, of clearing, bushfires and grazing (Breman and Kessler, 1995). To reverse these trends, plantations have been promoted by projects and the forest service, with monocultures of Eucalyptus trees mainly. These plantations are poor in terms of biodiversity and perform few forest functions (fuelwood mainly).

However, there is also evidence of positive changes. An inventory of local forest management practices showed that since the early 1980s villages take the initiative to establish village forests (Kessler and Boni, 1991). Village forests are natural forests with a relatively dense tree cover, with well-defined boundaries, regulated and restricted use, being managed, patrolled and protected by a village committee. The village forests are areas of relatively high biodiversity. For local people the value of the village forests is to provide medicinal products, herbs and grasses, tree fruits and wood. Villagers also refer to the need to protect nature, with its plants and animals, because these tend to disappear. They consider the forests as part of their patrimony and cultural heritage. Village forests are not anymore accessible to outsiders such as pastoralists. Nowadays some of these village forests also generate incomes through fees obtained from urban people who come to hunt.

Another positive change is provided by farmers near urban centres who shift from growing food crops to growing trees, either *Eucalyptus* for fuelwood or indigenous tree species for their products, which can be marketed for good prices in the urban area. Another advantage of tree crops is the fact that it requires little human labour, so labour can be used for off-farm employment in the nearby cities. Similar dynamics were observed around the urban centre of Kano where tree densities increased in the 1980s. This resulted from the increasing resistance among local farmers to provide firewood for urban use, the alternative uses and products derived from parkland trees, and local government restrictions of tree cutting (Cline-Cole et al., 1988). Where tree planting and management is driven by economic motives mainly, a change in economic factors will influence the profitability of this option. As in India the anticipated yield and profits from tree farming dwindled in the late 1980s, many farmers uprooted their *Eucalyptus* trees to revert back to annual food crops (Saxena, 1991).

These local initiatives to improve forest management are often in contradiction with the national laws, which state that all trees and forests are state owned and in principle open to everyone (de facto open access). Therefore, for these initiatives villagers require support from ‘innovative’ forestry agents to exclude ‘outsiders’ who refuse to abide by the locally determined regulations (Thomson and Coulibaly, 1995).
Summarising, these positive changes might be related with the following factors:

- Ecological factor: potential of trees to produce a variety of useful products and services
- Economic factor: growing scarcity of tree products and increasing prices on local markets, insight that trees and their products provide stability and resilience to drought
- Social factor: awareness to exclude outsiders and local organisation
- Institutional factor: decentralisation, and willingness to provide local management rights

**General insights**

The case study shows that many farmers have profound ecological knowledge about tree-crop interactions. Their motivations to manage farmed parkland trees are primarily focused at optimising the use of tree crops for subsistence or commercial purposes, but involve a long-term sustainability focus (Kessler, 1992; Timmer et al., 1996). There seems little reason to believe that new agroforestry techniques would perform better. These new techniques generally aim to maximise production goals of trees (e.g. by regular pruning to fertilise croplands with leaves, as proposed in alley cropping). This can cause degradation of the resource base in the same way as can be expected with any cash crop if sustained yield principles are not applied.

Woody plants provide stability through fodder in dry seasons, better resistance to drought, tree crops as ‘hunger crops’, high feed quality of tree forage, and income diversification. Woody plants provide resilience through storing water and nutrients, soil protection and improved soil structure. So-called ‘fertility islands’ with trees serve as refugia for animals and plants, and micro-climate stabilisation, particularly useful during and after drought periods.

Management of agroforestry systems should focus at striking a balance between the production goals and stability / resilience goals. The break-even point of making use of woody plants for productive purposes, while maintaining stability and resilience, has been worked out in detail by Breman and Kessler (1995). The ideal average tree density on parklands, determined by using an ecophysiological model\(^\text{10}\), was found to be comparable to what one finds on farmed parklands in the Sahel region.

This case study also demonstrates the dynamics of the different indigenous tree and forest management systems, in response to changes in ecological, cultural and socio-economic conditions (Wiersum, 1996). The variety of indigenous management practices can only be understood by looking at how these practices evolved in their historical context. Institutional factors, notably the state rules and regulations with respect to tree and forest management, have been largely responsible for suppressing local management practices which apparently included sustainability criteria. Another important factor has been the uncritical introduction of new concepts and practices (e.g. exotic tree species, and new agroforestry techniques) before understanding the rationale of local management systems.

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\(^{10}\) The model is based on closed nutrient cycling and maintenance of a water balance. With increasing tree cover, the competition between trees and annual crops will exceed the ecological benefits of trees for annual crops through more efficient recycling, uptake of nutrients from deep soil layers, and microbiological activities.
I.1.4 DESIGN IMPLICATIONS

1. A holistic valuation of ‘the environment’ requires a distinction of multiple environmental functions for multiple users. Insight in the dependency of local livelihood systems on environmental functions (material and non-material), both short-term production and long-term resilience, is helpful to gain insight in motivations for local management practices. Common property resources in particular have important supra-local environmental values.

Rangelands in semi-arid areas, not cleared and managed for agricultural crop production purposes, exhibit multiple functions for multiple local users. They have important non-material / non-market values through regulation and signification functions such as fertility management (through grazing and manure) and water balance regulation, aesthetics and sacred areas. In both case study areas the rangelands are part of mixed (agro-sylvo-pastoral) and complex livelihood systems. Apart from products, the rangelands provide (free-of-charge) stability and resilience to the whole system, particularly through the maintenance of a perennial vegetation cover (woody plants mainly).

Striking a balance between (short-term) production and (long-term) sustainability / resilience goals is the crux of the matter. The first set of goals is generally emphasised. Striking this balance is critical for local people who for the quality of their living strongly depend upon the local environment, such as relatively poor or marginalised social groups or communities who cannot afford external inputs. For these stakeholders both sustainable use and maintenance of biodiversity are important, because of the linkages between biodiversity, ecological regulation functions, stability and resilience of (agro-) ecosystems, and security and sustainability of livelihood systems (see chapter 2).

Apart from these local values, the environment has supra-local values with importance for multiple stakeholders at different levels. Common property resources have particularly important supra-local values (generally because of limited economic values by direct use). Supra-local values include products (e.g. areas for tourism, clean water from forests) and ecological processes that operate at a large scale (e.g. related to regional climate, soil protection, dust transport).

2. There is need to understand how indigenous natural resources management is adapted to local ecological conditions, particularly under conditions of resource scarcity. These insights can be obtained by looking at the adaptability of indigenous practices in the face of change and external disturbances. For that purpose, it is necessary to look over long time spans. These insights are a basis for maintaining or developing adaptive / resilient management systems.

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11 A good example comes from pastoral systems in Australia. Here, the presence of trees reduces pasture productivity in normal rainfall years (in comparison to a vegetation without trees), but is beneficial in dry years (Condon et al., 1969). In normal years trees suppress herbage production but in dry years the reduced susceptibility of trees to drought leads to higher forage availability, thus provides stability. After a drought, productivity is higher in vegetation with trees than without trees, thus emphasising its resilience.

12 Wild resources may provide up to 40% of income for poor households in Zimbabwe, or up to US$ 1100 per household per year in South Africa (Shackleton et al., 2000).

13 Soil management is essential to avoid undesirable wind and water erosion at a local and regional scale. But these processes also operate at large scales. For instance, there is evidence to assume that dust transported from the degraded West African Sahel zone damages coral reefs in the Caribbean, by changing the balance of nutrients in the water, and reducing the amount of water available for photosynthesis (WWF, 2000).
Indigenous management systems\textsuperscript{14} can be partly understood and explained by their ecological context. They ‘mimic’ characteristics of the ecological system, particularly where people closely depend upon environmental functions, and where management systems have developed under some (population) pressure to make most efficient use of natural resources and ecological processes. Since ecosystems are characterised by complex non-linear dynamics, well developed indigenous systems show characteristics of adaptability, as evidenced in the three case studies in this section. This is particularly true in resource-poor tropical environments where unpredictable changes are most apparent. In its most extreme form this leads to so-called opportunistic management systems, such as opportunistic grazing in the Sahel region\textsuperscript{15}. Insight in the functioning of indigenous management systems and practices, particularly their adaptability in the face of external change, can help understand the ecological system of the locality, and vice versa\textsuperscript{16}. This does not mean that indigenous management systems are always ecologically sustainable\textsuperscript{17}, but they do make ecological sense (by their close dependency on ecological dynamics)\textsuperscript{18}. These insights are helpful to develop more sustainable or adaptive management based on indigenous systems, as the first case study shows for the Syrian hema system.

I think more efficient and sustainable systems develop under conditions of increasing resource pressure, as can be observed in many resource-poor environments. So we can particularly learn about sustainable resource use from these situations.

Many contemporary natural resource management systems show an evolving mixture of the old and the new (Borrini-Feyerabend et al., 2000). To develop resilient management systems one must take into account underlying ecological regulation processes (e.g. regeneration processes) and the role of biodiversity (e.g. keystone species) (e.g. Drijver et al., 1995). While so-called redundant species may show their value only in the face of a major external shock (section 2.2), likewise certain indigenous management practices show their value only in the face of a major external disturbance (e.g. infrequent severe drought period). Unfortunately, outsiders often believe that indigenous management practices are irrational and only involve indiscriminate and opportunistic harvesting, rather than considering these as opportunities for further improvement (as was demonstrated in the third case study).

\textsuperscript{14} The term ‘indigenous management’ refers to activities that were generated by internal initiatives. It should not be equated with ‘traditional’, which implies customary or antiquity. Indigenous practices do not always date from the past, nor are they static (Wiersum, 1996).

\textsuperscript{15} Characteristics of opportunistic rangeland management systems of pastoralists are: mobility over large areas, diversity of incomes, rapid growth, local resource exhaustion and large fluctuations (Scoones, 1994).

\textsuperscript{16} For instance, grazing reserves are appropriate in the Yemen Montane Plains (case study 1), as part of a conservative type of rangeland management (Sandford, 1978), but this strategy is not appropriate for the Sahel region where pasture production is less predictable due to more unpredictable rainfall. Here, opportunistic rangeland management systems are more appropriate. Maintaining or restoring these systems is difficult as they require large areas (in view of greater resource variability), are very mobile and unpredictable (which implies more difficult to control), and the common property resources are generally less controlled by social institutions.

\textsuperscript{17} Recently much evidence has become available on local management systems that are not environmentally sustainable. There are many exceptions to the green romanticism view (e.g. Vayda and Walters, 1999).

\textsuperscript{18} Apart from the case studies, a good example is provided by Wiersum (1996), indicating that in mountain areas sacred forests are found near mountain tops or springs, and above villages. In this way they serve as \textit{de facto} watershed protection forests. Another example observed by myself, is that farms are always located above croplands, so that organic materials are transported by water onto the lower lying fields, and are not wasted.
3. **For design purposes attempts to quantify limitations to resource use will not be helpful.** However, one can assess trends, the direction of change and the speed of change, and agree on thresholds of desirable qualities and acceptable change.

Although everyone will agree that there are limitations to sustainable resource-use, in all case studies it turned out to be difficult to quantify concrete limits, for instance by calculating carrying capacity levels or thresholds for sustainable use. This is partly because too much variability and unpredictable factors are involved, while the level of knowledge on critical ecological processes in tropical countries is also limited. However, it is generally not difficult to achieve consensus on the (direction of) current environmental changes, on the possible consequences of these changes, and on levels or thresholds of unacceptable change. Linked to these insights, indicators can be defined which will allow resource-users and management institutions to assess the direction of change and the level of pressure on natural resources.

It is important to realise that the speed of change is at least as important as the direction of change. Both ecosystems and human management systems may adapt to gradual changes, but rapid changes would surpass the bounds of resilience, so lead to collapse.

4. **For design purposes insight should be acquired in the main socio-cultural and institutional factors that determine/d the functioning of indigenous management systems, and the underlying causes of change. This generally involves a mixture of internal and external factors. Care should be taken not to generalise, and to be specific.**

Past or present indigenous management systems are based on interplays of natural and human mechanisms. Critical human mechanisms of many common property management systems are social reciprocities, mutual trust and solidarities, including agreements on management and user rights of land and other natural resources. Strong local leaders are responsible for making and enforcing such agreements, particularly where these agreements have a long-term sustainability focus, not always compatible with short-term interests.

For instance, in Yemen local sheikhs can take major decisions regarding rangeland management (e.g. when grazing reserves can be grazed, when a well can be drilled, etc.), while in the Sahel region various traditional leaders take decisions with respect to land allocation, water use, hunting, fishing and grazing. These systems show changes due a mixture of internal and external factors. External pressures include the appropriation of ownership and management rights by colonial powers and nation states, causing a situation of open access of former common property management systems in many Sub-Sahara countries (De Groot et al., 1995). However, even in Yemen, where local communities and their leaders still own the communal grazing lands, indigenous grazing systems are being abandoned. This emphasises internal driving forces, apparent in the case studies: increasing human pressure (by population growth, immigration and/or increasing demands), monetisation of economic exchange, privatisation of natural resources, the incorporation of local economies into national economics, and the change of cultural belief systems. These driving forces may operate for common property resources as well as private property resources, putting them under pressure and possibly causing degradation.

5. **Rational models can help structure the interplay of determining factors, e.g. those explaining decision-making or change processes, but attention should also be given to non-rational factors. Insights into non-rational factors can be obtained by monitoring the dynamics of major events influencing resource-use.**
De Groot et al. (1995) developed a model to structure complexity and get a better-than-*ad-hoc* grip on the interplay of factors determining boundary defence of communal resources against outsiders. It is based on rational choice theory, describing the motivation for defence of the commons as a balance between the (expected, perceived) costs and benefits of boundary defence, and bringing together the main factors that determine these costs and benefits is a rational (economic) decision-making model. Natural and human factors can be incorporated in it, both from internal and external origin, either as a constraint (management cost) or as an opportunity (management benefit). Some critical rational factors for the model, relevant for the two case studies are: frequency and intensity of intrusions by outsiders, scarcity of the resources to be managed, labour costs, existence of alternative options, social cohesion and leadership, fines if being caught.

However, it is acknowledged that the outcomes of the model will be influenced by other (non-rational) factors, in a negative or positive way (from an environmental point of view). Local belief systems, traditions, cultural histories, ancestors etc. play an important role in natural resources management. In our case studies some non-rational factors involved were:

- Resistance to ‘old’ Islamic traditions as one reason to get rid of mahjur grazing reserves
- Strong attachment to local belief system and cultural traditions
- Security reasons to establish grazing reserves in between villages
- Strong non-material motivations of villagers to conserve real nature reserves around the village.

6. *It is useful to make an inventory of local initiatives and innovations for more sustainable resource-use in the face of major change (i.e. the exceptions to predominant trends). The analysis of such initiatives will generate insight in success factors and potential for replication.*

Both case studies show the emergence of local initiatives and unexpected dynamics, as a response to emerging problems (e.g. social conflicts, resource scarcity) or new opportunities (e.g. new urban markets). Local initiatives seem to depend upon a mixture of contextual conditions, as can be demonstrated for the case of the village forests in the Sahel region:

- **Ecological potentials** (the existence of some relatively intact forest areas generating concrete products and non-material values for local communities)
- **Clear social relations and management arrangements** (the existence of strong leadership, absence of major conflicts and arrangements to manage the village forests)
- **Concrete economic benefits** (the possibility to exclude outsiders from using the ‘open access’ resources is a major advantage for the whole community, the scarcity of forest products and emerging urban markets for these products)
- **Enabling legal context** (the villages can acquire de facto ownership, while the presence of a reliable forestry agent to exclude outsiders (pastoralists, urban people collecting wood, urban hunters) when these do not respect village rules is critical for success).

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19 Another model based on rational decision-making is that on herding patterns of semi-sedentary Fulani herdsmen, using an optimal foraging model where food intake is maximised (De Boer and Prins, 1989). The model showed that it can only explain herding patterns if applied to larger spatio-temporal scales than generally done. The limited spatial scale of key feed resources (e.g. croplands from where crop residues are obtained) should be considered alongside the wider context of mobility and unpredictable feed resource availability.
7. For design purposes it is useful to analyse the sustainability of ongoing change processes by looking at the 3 key values of ecosystems for human development goals.

For the two case study regions, changes in the 3 key values of the ecological system (section 2.2.4) can be used to capture the main patterns of change, as indicated in the following table. These general patterns could be further specified for different localities in terms of resource fluxes and changes in natural capital stocks, resource quantity (area covered) and quality (of products and services), and change of resilience. These insights should form a basis for planning and design.

<table>
<thead>
<tr>
<th>Key value</th>
<th>Yemen Montane Plains</th>
<th>Sahel region</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional procurement</strong></td>
<td>Increased incomes from cropland use due to use of irrigation, focus on cash crops and fodder crops. Unchanged for rangelands.</td>
<td>Increased incomes from croplands due to clearing of land and improved / accelerated resource concentration from rangelands. Declines for rangelands due to over-exploitation.</td>
</tr>
<tr>
<td><strong>Functional diversity</strong></td>
<td>Declines on rangelands as mahjur areas are neglected, and animal husbandry becomes more cut-and-carry. Agro-diversity declines if irrigated cash crops predominate over the indigenous diversity of dryland crops.</td>
<td>Declines if rangelands are increasingly converted to cropland, and if one type of agro-pastoral system will predominate. Indigenous practices are lost. Declines due to higher pressures on remaining forests.</td>
</tr>
<tr>
<td><strong>Resilience</strong></td>
<td>Declines due to high dependency on limited ground-water resources, economic / market factors, and neglect of mahjur adaptive systems. May be partly compensated by increased build up of human capital.</td>
<td>Declines due to neglect of ecological regulation functions of rangelands, and neglect of social reciprocity and solidarities due to privatisation. There is hardly build up of human capital.</td>
</tr>
</tbody>
</table>
I.2 REGIONAL AGRICULTURAL LAND-USE DYNAMICS

I.2.1 LAND REHABILITATION IN THE SAHEL REGION

Context and case study

Land-use in semi-arid regions has certain advantages as compared to more humid regions: high quality pastures, relatively few diseases (both for humans and livestock), and less vigorous weed growth. As a result, powerful political entities arose more frequently and persisted longer in semi-arid regions than in adjacent more humid regions (Bowden, 1979). However, in semi-arid regions ecological constraints for land-use are the low and highly fluctuating water and nutrient availability (Shmida and Burgess, 1988; Penning de Vries and Djitèye, 1991), and the occurrence of unpredictable locust outbreaks.

Ecological conditions in the Sahel region are particularly unfavourable due to the combination of:
- The high evaporative demand due to high temperatures, nowhere moderated by large bodies of water or higher elevations (contrary to most other semi-arid regions), in combination with the low rainfall
- The rapid decomposition of the soil organic matter, due to high temperatures in combination with high air humidity, thus affecting soil structure and susceptibility to water and wind erosion
- The presence of one long dry season (in contrast to two shorter ones), which enormous constraints to survival of perennial (woody) plants, humans and animals during the extremely long dry season
- The long term rainfall variability, with frequent occurrence of drought years.

Economic conditions in the Sahel region are also not favourable (e.g. low rate of industrialisation, land-locked countries, low per capita income, low purchasing power, poor infrastructure). There has been a deterioration of world market prices for most cash crops from the Sahel region (cotton, meat, cereals), but increased prices of inputs like fertiliser, making land-use intensification less feasible.

Over the last decades pressure on environmental resources has increased, leading to land scarcity as the main problem in the Sahel region (Van Keulen and Breman, 1990). This may trigger a process of land degradation, with supposed feed-back loops (e.g. poverty, more conflicts, less management, less resources, more poverty). However, there are also areas where agricultural intensification occurs, where villages successfully generate incomes from cash-crops, and areas with successful land rehabilitation (IFAD, 1992; Reij et al., 1996, Gray and Kevane, 2001). In spite of these successes, it seems that the pace of land rehabilitation does not catch up with the pace of land degradation (FAO, 1996). This is partly because land rehabilitation requires great efforts, particularly where over-use causes irreversible change, such as soil loss from slopes or the appearance of bare compacted soils.

This case study looked at possibilities of developing an approach for rehabilitation of degraded croplands that would be applicable by local villagers with minimal external inputs and incentives (Kessler et al., 1998). The study was based on an agreement with a village committee to rehabilitate a severely degraded cropland area of 20 ha during a study period of 5 years. This first of all included prohibition of current exploitation activities (grazing, bush fires, cutting or export of dead wood, collection of fruits, leaves or bark, cutting of grasses). Fencing being too costly, the area was patrolled by the village committee, including the right to punish offenders. This approach is similar to ‘indigenous’ management practices of village forests or pasture lands.

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20 In most other semi-arid regions, conditions for agricultural land-use are better due to: higher elevations (lower temperatures), higher soil fertility due to recent volcanic activities, presence of rivers with sediment deposition from upland areas (Sopher, 1980).
Results
Monitoring during a 5 year period demonstrated remarkable regeneration of the vegetation during the 5 year period, including the reappearance of some plant species (increase of biodiversity). Ecological factors that stimulated the regeneration process were strongly reduced (not absence of) exploitation, relatively high rainfall, and presence of termites (to open up the soil crust) and of sufficient remaining seeds and plant biomass. It was demonstrated that high rainfall more than reduced grazing pressure influenced vegetation regrowth. Various low-cost ‘indigenous’ restoration measures were used to speed up the rehabilitation process, such as alignments of dead wood or stones and mulching, to trap moisture and accelerate regeneration. In spite of the successful rehabilitation, the results were not sustainable. During the study period village management of the area was increasingly neglected, and after the 5 year period exploitation levels reverted ‘back-to-normal’. This will arrest the rehabilitation process and probably cause renewed degradation.

A socio-economic study undertaken after the study period showed why local management was not continued according to expectations (Ouédraogo, 1995):
1. Surrounding villages and pastoralists making use of the area had been informed, but had not been involved; in particular pastoralists neglected the agreement, certainly after the study period
2. For the village, rehabilitation of a degraded area of 20 ha was not considered important, as there remains plenty of arable land and other short-term income options; for the village management committee motivation was mainly based on expected personal benefits
3. The village management committee members were not selected properly, aggravating existing social conflicts in the village, and causing poor dissemination of information among villagers
4. Insufficient village-wide communication on the objectives of the study caused several misunderstandings that were difficult to correct at a later stage.

General insights
While degraded sandy soils show vegetation regeneration with rainfall, albeit of low quality and low biodiversity, degraded sandy-loam soils seem to loose their resilience. They get compacted and do not show spontaneous vegetation regeneration even with good rainfall and full protection. Two types of measures are required to rehabilitate such degraded lands (Kessler and Laban, 1994):
1. Stabilisation measures to avoid or minimise further degradation (by reducing pressures e.g. through protection and controlled use), and
2. Restoration measures to restore ecosystem qualities by vegetative (e.g. reseeding, reforestation) or mechanical (e.g. ploughing, breaking the crust) measures.

The case study shows how the combination of stabilisation measures and low-cost restoration measures resulted in effective regeneration, including reappearance of plant species. But even after five years regeneration was patchy and limited to locations where water and nutrients are trapped. Processes of soil restoration require long periods to be completed, more so as ecological conditions are less favourable and land is more degraded. Rehabilitation can be accelerated by using more costly restoration measures (e.g. seeds, fertiliser, a tractor), and can then generate crops and other products within a short period.

The case study also demonstrates that socio-economic aspects are critical for technical measures to be successful and sustainable. Kessler and Laban (1994) mention the following socio-economic preconditions for local land management to be successful and to be sustained:
- Concrete benefits, preferably as soon as possible
- Knowledge and capacities to manage the land in a sustainable way
- Legal security, in terms of endowments and entitlements
- Strong local organisation and leadership, to defend interests against outsiders.
It appears difficult to avoid that land rehabilitation at first particularly benefits certain villagers. Other experiences confirm this situation. For instance, anti-erosion dikes in central Burkina Faso are often constructed at localities owned by village chiefs (Brasser et Vlaar, 1990). A few wealthy villagers often own the croplands with the best potentials for rehabilitation, or likewise, for intensification. This need not be a problem, as long as the activities are not misused by some to acquire more wealth at the expense of others, and if in the medium and long term others can be expected to benefit as well.

The question of when a natural resource can be considered to be 'degraded'. Obviously, for many villagers the condition of the area before being rehabilitated was not considered a problem, as it still performed various functions, while sufficiently productive croplands were still available elsewhere.
I.2.2 AN EVALUATION OF THE POTENTIALS FOR SUSTAINABLE AGRICULTURE

Context and case study
The following two typical situations can be distinguished with respect to the farm systems in tropical countries (most farms actually include a mixture of these two types):

1. **High External Input Agriculture (HEIA):** productivity is maintained by intensive use of external inputs, mainly non-renewable resources (e.g. fertilisers, pesticides, fossil fuels), and high-cost, ‘exogenous’ technology (e.g. mechanisation, improved seeds). HEIA farm systems are generally associated with cash-crop production and the Green Revolution.

2. **Low External Input Agriculture (LEIA):** productivity is maintained by use of the local renewable resources (e.g. organic fertilisers), with little or no use of external inputs, and low-cost, ‘indigenous’ or ‘endogenous’ technology mainly. LEIA farm systems are generally for subsistence needs mainly. About 25% of the world’s population depends on LEIA farm systems.

Negative environmental and socio-economical impacts of HEIA farm systems are by now well known, mainly from countries where the Green Revolution has been promoted (e.g. Glaeser, 1987; Adams, 1990). Environmental impacts include loss of biodiversity, soil erosion due to monocultures with low soil cover, soil pollution due to excessive use of agro-chemicals, and soil compaction due to excessive use of machinery. Socio-economic problems are related to increasing dependency on high external inputs (of which prices generally increased), to unequal access to markets and to unequal land ownership so that smallholder HEIA farms are increasingly forced into a debt crisis. LEIA systems can be sustainable when population densities are low. However, where population densities increase, LEIA systems may lead to soil depletion and soil degradation, causing poverty and low food security.

Initially as a reaction to negative impacts of the Green Revolution, alternative concepts of agricultural development were developed, referred to as ecological, sustainable or low external input agriculture (Adams, 1990; Reijntjes et al., 1992). Sustainable agriculture aims at adapting and designing agricultural systems to the environment, optimising the use of biological resources, minimising changes in the natural ecosystem and the use of external inputs (Pimentel et al., 1989), as well as maintaining social values and an acceptable level of income security. The LEISA acronym (Low External Input Sustainable Agriculture) is one such promising concepts of sustainable agriculture (Reijntjes et al., 1992).

In 1994 a survey was held in Ghana and the Philippines to evaluate to what extent LEISA is sustainable, and if so for which techniques and under which ecological and socio-economic conditions (Kessler and Moolhuijzen, 1994). More specifically, the aim was to evaluate to what extent LEISA is a strategy of sustainable agriculture that can meet objectives of improving ecological sustainability, and improving socio-economic conditions of (poor) farmers (by increased incomes or reduced costs). The results presented in this case study summarise findings from a range of local situations.

Results
LEISA involves techniques such as organic farming, soil and water conservation, integrated pest management and agroforestry. These techniques may generate production increases without the use of external inputs, by any or a combination of the following ecological processes.

1. **Resource depletion**, i.e. more effective exploitation of resources, possibly at intensities that exceed soil fertility regeneration capacities (‘soil mining’). There are risks for soil degradation as soil depletion and reduced vegetation cover occurs.
2. **Spatial resource concentration**, i.e. transport of resources from one (large) area towards another (small) area, causing resource concentration for productive purposes. This process is particularly important in resource-poor environments, and might be associated with depletion in areas of origin.\(^{21}\)

3. **Resource enrichment**, i.e. the increased availability of resources by natural processes. Examples are introducing deep-rooting trees utilising nutrients from deep soil layers, or leguminous plants that fix nitrogen, or more nutritious grasses (increase of ‘carrying capacity’). These potentials are limited.

4. **Reduction of resource losses**, e.g. reduced losses through erosion or leaching by maintenance of vegetation cover and a dense and perennial root system, and by soil conservation. Potentials for this process are highest where degradation occurs, and forms the basis for rehabilitation processes (e.g. capture of run-off from degraded slopes).

5. **Increased efficiency**, i.e. of transforming resources into desirable products (e.g. through plant varieties that utilise less water or nutrients). In most cases this process is associated with loss of other functions (e.g. fodder production).

In resource-poor environments there are limited potentials to benefit from processes of enrichment, reduction of losses or increased efficiency. There is also a contradiction between the need to maintain maximum standing biomass for sustainability (soil protection) purposes, and, on the other hand, the need for farmers to increase off-take of biomass (for production purposes). The same reasoning applies to the need to maintain high soil organic matter concentrations for sustainability (soil structure) purposes, and exploitation goals. Thus, in resource-poor environments it is more difficult to achieve production increases without resource depletion.

There are four typical situations encountered during the field survey in Ghana and the Philippines.

1. In semi-arid northern Ghana, with heavily degraded lands, LEISA techniques do not show much results in terms of improved farm productivity. The work is hard, and the benefits are doubtful, partly due to recurrent drought years. For instance, the use of manure does not provide any yield increase if rainfall is poor. Economic potentials are limited. While there is ecological potential for fruit and vegetable production, there are no local markets and infrastructure (for export) is poor. Many farmers prefer to (seasonally) migrate to coastal areas, for off-farm employment. Some farmers applying LEISA techniques do so mainly because of the associated advantages of food aid and social services provided by NGOs and projects involved.

2. In sub-humid northern Ghana, LEISA techniques are promoted by providing various incentives such as tree seedlings, labour saving tools and animal traction implements on credit. Some soil conservation works are successful, leading to higher crop yields. The new techniques are generally applied by relatively well-to-do farmers on their privately owned lands. Payback of credits is low. Women do much of the work involved, as men often are away as seasonal labourers. LEISA techniques are not applied for rehabilitation of common property lands. One reason is that of the insecurity of control over long term benefits. Here, women have to do most of the work. Where a womens’ group had gained access to land, they successfully applied LEISA techniques such as tree planting and introduction of new garden crops. Assistance to acquire better land security would be one way to expand such initiatives.

\(^{21}\) As water and/or nutrients are scarcer, spatial concentration of these resources is an advantage for production potentials of an agro-ecosystem. This is due to the fact that as long as the relationship between production and resource availability is exponential, the average production of the system where scarce resources have been concentrated is higher than in the original situation, characterised by a homogeneous distribution of scarce resources (Breman and Kessler, 1995).
3. In sub-humid degraded uplands in Cebu (Philippines) one village succeeded in major rehabilitation of degraded slopes, by building terraces, growing fodder crops, producing vegetables, planting trees etc. The nearby lowlands where urban areas and industrial activities are located offer two opportunities. Firstly, organic wastes from poultry farms and piggeries can be used free of charge (apart from transportation costs) and give higher yields when used as organic fertilisers. Secondly, vegetables produced in the uplands are easily marketed in the urbanised lowlands. Gradually, a more productive agro-ecosystem develops through build-up of productive soils on terraces mainly, and through effective recycling of organic materials. The community as a whole appears to be motivated now that benefits are clear, and farmers start organising themselves in co-operatives.

4. In the humid rice-producing area in the Philippines, one LEISA activity is the promotion of organic fertilisers to replace inorganic fertilisers. Farmers can obtain credits from the NGO if they apply a minimum of chemical fertilisers. This can help reduce dependency of farmers on official banks that only provide loans for high external input methods. Most participating farmers own their land, but the NGO also intermediates in tenant farmers obtaining land ownership. Rice produced with organic fertilisers causes somewhat lower yields, but the plants are more hardy, thus less susceptible to damage by typhoons and drought. Farmers are satisfied because expenses are lower, whereas incomes have remained almost unchanged. There are also less health hazards, less pollution, greater yield stability and greater self-reliance. A remaining constraint is the free distribution by the state of chemical fertilisers, discouraging farmers to use organic fertilisers.

Relevant insights
The LEISA concept is embraced by both environmentalists and those oriented at alleviating rural poverty, because it contains the promise of improving both ecological sustainability and socio-economic well-being of (poor) farmers. The latter can be achieved through increased incomes or reduced costs. The case studies showed that the potential to simultaneously meet both objectives first of all depends upon the ecological and economic site conditions, as follows.

Most HEIA farm systems occur under favourable ecological and economic conditions. Here, LEISA techniques offer alternatives to excessive use of external inputs which is typical for HEIA farms. This will improve ecological conditions (by reducing pollution and stimulating ecological regulation processes) as well as socio-economic conditions (by reduced expenses, increased self-reliance, and reduced health risks). Economic and political reform may be required to create a supportive institutional context for farmers to adopt LEISA techniques. This corresponds to the above case study situation 4.

Where LEIA farm systems occur under favourable ecological conditions, LEISA techniques can help make more efficient use of available resources to improve incomes. However, most LEIA farm systems are found under unfavourable ecological and economic conditions (situations 1 and 2), and resource scarcity due to population pressure. Here, the potential to meet both LEISA objectives is limited, because:

- There usually is no scope to reduce costs, as external inputs are rarely used
- To be sustainable, production increases must originate from the reduction of resource losses or enrichment processes, but most local practices already involve both aspects
- Where production increases result from more intensive resource use it is often based on more effective resource depletion and therefore is not sustainable
- Where there is potential for land rehabilitation, this requires much efforts and involves a transition period during which costs are high but revenues are relatively low
- Production increase often results from an increased resource utilisation by few farmers.

22 For instance, increasing the use of mulch or organic fertilisers that originate from rangeland areas to maintain cropland productivity is a common LEISA practice, with risks for overgrazing and degradation of rangelands.
Under favourable economic conditions, farmers can more easily get access to external inputs or generate incomes (through marketing of products), to be used to improve the farm system (situation 3). This might involve the use of organic wastes, good infrastructure, social services, local or export markets, presence of information sources, etc. However, where economic conditions are good, the presence of off-farm employment opportunities may reduce farmer’s motivation to adopt LEISA techniques.

Where the ecological and/or economical potentials are good, social, cultural or institutional constraints may limit the possibilities to realise these potentials. At a local level most important are:

- High labour costs (usually associated with better off-farm employment opportunities) or labour shortage (usually associated with emigration for better (off-farm) employment)
- Land tenure insecurity, e.g. of immigrants or women.

At a supra-level most important are:

- Poor credit systems, e.g. to fund transition periods associated with land rehabilitation
- Adverse Government policies, like perverse subsidies, high taxes or unfair land policies
- Government opposition to NGO’s promoting LEISA techniques
- Poor or controversial information supply (e.g. ineffective agricultural extension service).

<table>
<thead>
<tr>
<th>Economic potentials</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Societal composition</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Resources availability</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Productive efficiency</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Environmental impacts</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table I.1: Economic and ecological land-use potentials, and potentials for LEISA to meet environmental (ENV) and socio-economic (SEC) objectives, in different situations
I.2.3 LAND-USE INTENSIFICATION IN RESOURCE-POOR ENVIRONMENTS

Context and case study

Increasing human pressure on the environment may be due to local demands (in terms of population numbers and/or demands per capita) and/or increasing exports of products (e.g. to feed urban populations). As human pressures continue to increase, the capacity to increase productivity of the land by improving the efficiency of resource-use by ‘low external input’ technologies reaches its limits. Induced innovation may take place, which implies that over time, technological innovations and institutional change take place to economise on scarce resources and utilise the abundant ones (Kerr, 1998). The question is whether induced innovation takes place in time, and will be sufficiently effective, to avoid land degradation.

There are a few options to reduce pressure on scarce resources and avoid or reverse land degradation:

1. Emigration towards ‘empty lands’ (finally leading to saturation elsewhere and therefore not really sustainable)
2. Use of resources that are still relatively abundant (e.g. minerals, hydropower), while reducing the use of scarce resources (e.g. soils).
3. Off-farm employment (‘ecological release’), either locally (income diversification, small scale industries, trade, etc.) or elsewhere (e.g. emigration towards urban centres or abroad)
4. Intensified use of scarce resources, defined as a more efficient use of scarce resources, i.e. an increase in total input per unit land area (Carter et al., 1992)
5. Rehabilitation of degraded land, usually with inputs from more productive zones or sectors.

Note that there is a gradual distinction between land-use intensification and rehabilitation, in terms of the proper definition (when a situation is ‘degraded’) and in terms of the processes involved (usually mixed, and reinforcing each other). Land-use intensification and rehabilitation requires external inputs (from supra-local levels), such as new technologies, labour, natural resources (e.g. chemical fertilisers, supplementary feeds, energy), capital resources (e.g. machinery), external markets, off-farm employment opportunities, food supplies, etc. This is necessary to overcome natural limitations of increasing productivity by ecological processes at a local level (Fig. I.2). The question is under which conditions land-use intensification processes can be successful (in terms of being able to feed growing populations) and sustainable (in an ecological and social sense), particularly where ecological production potentials are not favourable (resource-poor environments).

This case study is based on a number of studies on resource-poor environments demonstrating successful intensification processes. These were analysed in order to draw general conclusions, particularly with respect to success factors and the potentials for replication.

One well-known example is Machakos region in Kenya (e.g. Tiffen et al., 1993; English et al., 1994; Murton, 1999). In the late 1930’s this region was considered to degrade alarmingly. In the early 1990’s the region has a population five times greater and the value of agricultural output per head is estimated to be three times larger than it was. The increased per capita value of agricultural production has been almost entirely in the form of cash crops. Both expansion and intensification processes have occurred: the area under cultivation has expanded five times, and the productive capacity has been raised. In total 45 new technologies were adopted, among which most important are: terracing, ox-drawn ploughs requiring only two animals, early maturing maize varieties, use of crop residues, use of animal manure. It has been concluded that population and agricultural growth have been environmentally sound, referring to soil conservation measures mainly. The remaining rangelands are said to be in good condition, with a higher proportion of woody species than earlier.
Other cases of successful agricultural intensification processes in relatively resource-poor environments that were analysed are:

- The southern hills on Java - Indonesia (Nibbering, 1991) and the hills on the island of Cebu - the Philippines (Brown and Korte, 1997). Both are upland areas characterised by relatively low rainfall and drought periods, relatively poor soils, poor moisture retention due to limestone rocks, and severe soil degradation during recent years. Both have shown land intensification processes since decades.
- The savanna area in southern Mali (Breman, 1990; FAO, 1995) and in Sukumaland in Tanzania (Meertens et al., 1996). Both are sub-humid climate zones, with relatively poor soils, but so far limited soil degradation. In both of these cases processes of agricultural intensification have started only recently and are less convincing than in Machakos.

Figure I.2: Ecological processes relevant to nutrient cycling within an agro-sylvo-pastoral production system, and possible inputs from supra-local level influencing the local system.
Results
Tiffen et al. (1993) conclude that in the Machakos area the main driving force for agricultural intensification is the autonomous effect of an increased population, leading to a higher demand for food, more labour availability and more people interacting to develop innovations, accompanied by a reduction in the per capita costs of physical and social infrastructure. These autonomous effects can be impeded or be assisted by Government, or by other organisations. The main ways by which such developments can be assisted are through:

- Encouraging private investment through market growth
- Increasing knowledge and management capacities through formal and informal education
- Facilitating saving and formal credit
- Securing land tenure
- Orienting communities to self-help, developing their own skills and management
- Stimulating the development of small towns with jobs and off-farm income opportunities
- Investing in improved infrastructure
- Generating improved technologies and promotion of successful ones
- Stimulating participation and accountability at decentralised policy levels.

The question remains to what extent these supportive measures would work out successfully in different contexts. From my analysis of this case and the other cases mentioned above, it is possible to give some indication about the potentials for land-use intensification, and thus the potential effectiveness of these supportive measures.

1. Land pressure is an essential factor for change to take place. Small land owners are generally more motivated to adopt land rehabilitation and land-use intensification measures, provided that they have the means to do so. Women are generally more motivated than men. Where there are still plenty of (land) resources, extractive (and relatively inefficient) resource-use systems are more cost-effective. So induced innovation and land degradation have an economic rationale.

2. Potentials for successful intensification processes improve as ecological conditions are more favourable (higher rainfall, less erosion, better soil fertility), because the returns to inputs are higher. Farmers start applying more efficient resource-use practices at locations with relatively favourable ecological conditions.

3. Soil and water conservation is crucial for land stabilisation and restoration purposes (particularly in resource-poor environments), and is one condition for successful intensification. But it should generate short term benefits or be subsidised. In a degraded situation, short-term benefits can be acquired by capturing nutrients and water that would otherwise have been lost. This potential is greater where ecological conditions are more favourable (see above).

4. Favourable economic conditions (nearby markets, off-farm employment opportunities, attractive price relations, good transport networks, availability of inputs) trigger land-use intensification. In South Mali intensification was triggered by cotton, with a well-organised market and secured prices. In Machakos the urban markets in nearby Nairobi was the main driving force. Inputs from supra-local level (e.g. chemical fertilisers) are essential, if not the intensification process may be arrested (case of South Mali following a sharp increase of fertiliser prices in the early 1990s).

5. Where such economic potentials exist, emigration or off-farm employment seems to be a preferred over agricultural intensification. This might stimulate an active role of the remaining women in driving intensification processes. It may also stimulate the adoption of management systems that require less labour, e.g. tree crops.
6. The relationship between land tenure security and the propensity to adopt new technologies improving the land is variable: private land ownership is generally most favourable, but tenant systems often do not constitute real barriers if potentials for short-term benefits exist. However, there is a general tendency for land-use intensification to benefit the richest layers of society, as these have the land and other resources to make necessary investments (Murton, 1999; Gray and Kevane, 2001).

7. People must be sufficiently informed and trained to successfully adapt new technologies to local conditions. These capacities are stimulated by local people travelling abroad and having contacts and networks, e.g. with traders, NGO’s, Church based organisations, and information channels (e.g. in urban centres). Migrant labourers play a positive role by generating remittances for essential investments and bringing in new ideas for innovations.

8. Ethnic homogeneity, clear leadership and a sufficient level of education (among men and women) are essential for stimulating agricultural intensification.

A comparison of some key factors of the Machakos region with the region ‘Centre Nord’ in central Burkina Faso is interesting to assess to what extent the Machakos experience could be replicated (Table I.2). Note that the other case studies of agricultural intensification that were examined have characteristics more comparable to Machakos than to central Burkina Faso.

Table I.2: Comparison of some characteristics of Machakos region – Kenya (Tiffen et al., 1993) and the region ‘Centre-Nord’ in central Burkina Faso (MAE, 1990).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Machakos region – Kenya</th>
<th>region ‘Centre-Nord’ - Burkina Faso</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological factors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- rainfall</td>
<td>900 mm (600-1000), bimodal</td>
<td>600 mm (350-900), unimodal</td>
</tr>
<tr>
<td>- 90% probability</td>
<td>645 mm</td>
<td>425 mm</td>
</tr>
<tr>
<td>- soil fertility (%C; %N; ppm P)</td>
<td>0.7 ; 0.1 ; 7.0-22.0</td>
<td>&lt;1.0 ; &lt;0.05 ; &lt; 5.0</td>
</tr>
<tr>
<td>- potential evapotranspiration</td>
<td>moderate (elevated)</td>
<td>high (temperatures)</td>
</tr>
<tr>
<td>- proportion degraded land</td>
<td>37% (1972) but since then declined</td>
<td>24% (1990)</td>
</tr>
<tr>
<td>Social factors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- population density per km2</td>
<td>40 - 285 (1980)</td>
<td>41 (1990)</td>
</tr>
<tr>
<td>- % males / females able to read</td>
<td>68% / 42% (1980)</td>
<td>6% / 2% (1990)</td>
</tr>
<tr>
<td>- land tenure</td>
<td>private ownership</td>
<td>variable, often uncertain</td>
</tr>
<tr>
<td>Economic factors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- vicinity of an urban area</td>
<td>Yes (Nairobi)</td>
<td>No</td>
</tr>
<tr>
<td>- proportion cultivated</td>
<td>20-80% (1978)</td>
<td>15% (1990)</td>
</tr>
<tr>
<td>- proportion terraced land</td>
<td>96% (1978)</td>
<td>6% (1990)</td>
</tr>
<tr>
<td>- average yields main cereal crop</td>
<td>800-1000 kg/ha (maize)</td>
<td>450-850 kg/ha (millet and sorghum)</td>
</tr>
<tr>
<td>- cultivated area / head</td>
<td>0.29 ha (1987)</td>
<td>0.41 ha (1990)</td>
</tr>
<tr>
<td>- cash crops</td>
<td>coffee, cotton, vegetables, fruits</td>
<td>(vegetables, cotton)</td>
</tr>
<tr>
<td>- % less than 2 km from market</td>
<td>30% (1983)</td>
<td>?, but very low</td>
</tr>
<tr>
<td>- % owing a plough</td>
<td>63% (1980)</td>
<td>2% (of which only about 50% in use)</td>
</tr>
<tr>
<td>- % using chemical fertiliser</td>
<td>2% (1980)</td>
<td>20-30% on cotton only (1990)</td>
</tr>
<tr>
<td>- Livestock Units per households</td>
<td>8-16 LSU (1980)</td>
<td>2.7-4.7 LSU (1990)</td>
</tr>
</tbody>
</table>
Insights
With respect to the use of natural resources, there appears to be an economic rationale to continue to exploit these resources to a certain level of degradation, as long as investments in improved resource-use efficiency do not generate more benefits than continuous exploitation. The economic theory assumes that the system is ‘self-correcting’ as resource scarcity induces development of more sustainable resource-use options. However, the question is whether induced innovation always occurs ‘in time’ to avoid irreversible environmental degradation, i.e. at least some loss of some biodiversity and ecological processes that are not critical for local livelihoods.

It may be hypothesised that particular unfavourable (economic and ecological) conditions, such as encountered in resource-poor environments, do not allow population densities to increase to such levels as would be required to develop positive effects, such as urban development and higher food demands, people interacting to develop innovations, and reduced per capita costs of physical and social infrastructure. Thus, it can be expected that before such population densities are reached, land degradation and emigration will take place. The evidence of land-use changes in the Sahel region so far is not unambiguous, there are pockets of land-use intensification, but wide-spread areas where intensification does not occur.

Given the limited potentials for agricultural intensification in resource-poor environments such as the Sahel region, it is not surprising that many people in such regions have actually opted for other livelihood strategies. For instance, in the region ‘Centre-Nord’ one out of 8 persons has left permanently in the period 1980-90 (MAE, 1990). In some rural zones in central Burkina Faso households acquire up to 50% of their annual revenues from migrant workers in urban centres or coastal countries, largely contributing to the capacity to survive by purchasing food (FAO, 1996). Under such conditions subsidies might be justified to stimulate local development processes, from an environmental as well as social point of view, to avoid progressive land degradation with potential negative impacts that surpass the local level (Kessler and Laban, 1994; Teme et al., 1996).

This would imply that for resource-poor environments where induced innovation does not occur, external inputs are required, on a temporary or continuous basis, to avoid land degradation. The justification would be found with the unacceptable loss of supra-local environmental or social values. The point is that the new equilibrium that could install itself at local level, through self-correction as resource scarcity increases, will most probably imply a loss of biodiversity and some ecological processes. These might be critical for long-term resilience.

I.2.4 DESIGN IMPLICATIONS

1. For a design to meet sustainability objectives, insight is required in the present quality of ecological processes and the way these are being managed. If ecological processes are still relatively intact, or can be easily restored, intensification processes have better chances to be successful.

As pressures on scarce natural resources increase, managing these in a sustainable manner requires two interrelated components:

- Managing ecological processes, such as stabilising, buffering and regeneration processes, as basis for stability and resilience. These processes operate at both local and supra-local level, the latter including rangelands and forests at a relatively large spatial scale (Figure I.1). Where such

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23 Examples of world-wide environmental impacts are climatic change and loss of biodiversity, examples of world-wide social impacts are ‘ecological refugees’ and conflicts for limited resources among different users.
ecological processes have been degraded, rehabilitation is required to restore this situation. Rehabilitation involves stabilising and restoration measures (see case study 1).

- Intensifying land-use to increase production levels beyond the ‘natural capacity’, by making use of external inputs and capital resources from supra-local levels (Figure I.2). Intensification also requires organisational change and institutional reform.

Land-use intensification will be more efficient and less costly where ecological processes function well. For instance, processes of natural pest control, nutrient recycling and soil conservation make land-use intensification more effective, and will help reduce management costs and inputs. These processes help to reduce losses, make more efficient use of external inputs24, and maintain resilience at optimal levels. A fundamental condition is also maintenance of agro-diversity (e.g. of different habitats and crops). These are particularly important conditions in fragile ecosystems (see section 2.2.2), with high risks for irreversible degradation (e.g. soil loss).

The potentials for land rehabilitation and intensification depend upon several factors, including ecological factors:

- Where excessive use is being made of external inputs, there is potential to restore ecological processes and thus make more efficient use of these inputs. This is cost-effective.
- Where over-exploitation occurs, rehabilitation requires certain investments. These could generate short-term benefits if a reduction of losses can take place, e.g. by capturing nutrients and water that would otherwise have been lost.
- In resource-poor environments, to increase production to feed growing populations will meet limits of resource depletion (although these are difficult to quantify), while the use of external inputs is less profitable.

2. Economic conditions at supra-local levels, and their dynamics, strongly influence potentials for sustainable land-use at local levels. This is particularly important for resource-poor environments (in view of potentials for capital inputs and off-farm employment). Strong external triggers can avoid land degradation, and stimulate early induced innovation.

The potentials for sustainable land-use are strongly influenced by the relations with supra-local levels, for instance external inputs to increase the local production capacity (see Fig. I.2 for nutrient cycling). This refers to the economic potentials in a wider region: off-farm employment opportunities, migration patterns, urban demand for products, organic wastes that can be used, profitable markets, etc. Successful land-use intensification in Machakos has been mainly attributed to proximity of Nairobi markets (Murton, 1999). These economic potentials can trigger both land rehabilitation and land-use intensification by using external investments, and provide off-farm employment opportunities, which implies that land-use systems become less dependent upon local natural resources. As such, the economic developments in urban centres and other markets are important in terms of influencing local land-use systems and triggering land-use intensification, possibly more so than the dynamics at local level.

24 A critical link is integrated soil management to maintain a high soil organic matter. A high soil organic matter status will increase the recovery rate of any fertility inputs (organic or inorganic) and thus improve the feasibility of external inputs. This has been demonstrated for the Sahel region (Téme et al., 1996, Breman and Sisoko, 1997). The maintenance of trees plays a crucial role in this respect, as these stabilise the soil and improve soil organic matter (Breman and Kessler, 1994). Various enrichment processes (such as nitrogen fixation) also become more effective under conditions of good soil management.
Linkages with supra-local levels are particularly important for resource-poor environments, where ecological production capacities are limited. Here, soon the use of external inputs is indispensable for sustainable land use with growing populations as natural production potentials are limited (Van Keulen & Breman, 1990). Here, subsidies to enable poor farmers to use inorganic fertilisers might be justified both from an environmental and socio-economic point of view (Témé et al., 1996). However, well functioning ecological processes are one condition for environmental sustainability.

3. Apart from ecological and economic factors, there is need to map the social, cultural and institutional factors that influence the current (resource-use) dynamics. Some of these factors are found at supra-local levels. While ecological and economic factors determine land-use potentials, socio-cultural and institutional factors determine to what extent these potentials can be realised.

Apart from ecological and economic factors, socio-cultural and institutional factors influence land-use dynamics. For instance, the case study in section I.3.1 showed that neglect of socio-cultural factors can lead to failure of land rehabilitation. Effective agricultural extension and ethnic homogeneity are among factors that have favoured land-use intensification in the Machakos region. It is becoming clear that there are always multiple factors involved in explaining land-use dynamics, for instance success (or failure) of land rehabilitation or intensification. These factors may be referred to as success factors. A range of success factors is involved, in different categories, for instance:

- At different levels: local (household, community, agro-ecosystem), and supra-local (sub-national, national and international)
- From different domains: ecological, social, institutional, economic, cultural, political
- With different degrees of impact: direct (proxy) or indirect (root or fundamental causes).

In line with the results of the second case study (section I.3.2), one might state that ecological and economic success factors determine land-use potentials, while socio-cultural and institutional factors determine to what extent these potentials can be realised. The latter constitute the ‘enabling context’ for potentials to be realised. Some of the success factors encountered have been listed in Table I.3, classified by different domains.

For specific situations it is generally possible to identify the key issues involved, and how these influence the potentials for sustainable land-use. However, the interplay between these factors is complex and has a considerable degree of unpredictability. Thus, it will be difficult to make any predictions based on these insights.

As a rule of thumb, the five most important factors determining potentials for sustainable land-use appear to be the following:

1. Ecological potentials and current condition / level of degradation
2. Access to markets and economic opportunities
3. Perceived environmental scarcity
4. Land tenure / resource ownership characteristics
5. Enabling institutional context (rules and regulations leaving room for local dynamics)
Table I.3: Factors determining potentials of sustainable resource-use, and how these influence potentials

<table>
<thead>
<tr>
<th>Category of determining factor</th>
<th>Success factors</th>
<th>Positive, negative or variable influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological</td>
<td>• Productivity of the natural resource base</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>• Production variability and resilience</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>• Current condition (level of degradation)</td>
<td>- / +</td>
</tr>
<tr>
<td></td>
<td>• Potentials for rehabilitation</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>• Pressure on natural resources, scarcity</td>
<td>- / +</td>
</tr>
<tr>
<td>Economic</td>
<td>• Alternative options / income opportunities</td>
<td>- / +</td>
</tr>
<tr>
<td></td>
<td>• Attractive markets</td>
<td>- / +</td>
</tr>
<tr>
<td></td>
<td>• Labour costs</td>
<td>- / +</td>
</tr>
<tr>
<td></td>
<td>• Average income / poverty level</td>
<td>- / +</td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>• Local power structure (leadership)</td>
<td>- / +</td>
</tr>
<tr>
<td></td>
<td>• Ethnic homogeneity and good social relations</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>• Equity in terms of gender and wealth</td>
<td>+</td>
</tr>
<tr>
<td>Institutional (local level)</td>
<td>• Community-based management arrangements</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>• Resource–use tenure and management rights</td>
<td>- / +</td>
</tr>
<tr>
<td></td>
<td>• Rights to resource-use benefits</td>
<td>- / +</td>
</tr>
<tr>
<td>Institutional (supra-local level)</td>
<td>• Assigned management responsibilities</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>• Reliability and quality of state agencies</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>• Information supply</td>
<td>- / +</td>
</tr>
<tr>
<td></td>
<td>• Extension services</td>
<td>- / +</td>
</tr>
</tbody>
</table>

4. Thorough empirical studies of land-use systems are unlikely to be a sufficient basis for good predictions. Particularly important are insights in underlying motivations and normative perspectives (e.g. on assumed degradation status), and how these are related to land-use dynamics and patterns.

Having looked at several empirical issues, we now address the normative issues involved. First of all, there is the question of desirable land qualities, and when land should be considered as degraded. This is important to know when stakeholders are willing to undertake rehabilitation actions and take up management responsibilities and make appropriate investments. Land degradation is defined as the capability of land to satisfy a particular use (Blaikie and Brookfield, 1987). Thus, it is a normative concept, like ‘carrying capacity’ 25. In line with the problem-in-context theory (section 2.4.2) land degradation can be defined as a negative discrepancy between the norms or standards of desirable land qualities and the current situation. It seems that such norms are variable, and may depend upon:

- The dependency on the land and the availability of alternative options for income generation
- The current use of the ‘degraded’ area, e.g. for run-off (to collect water in downstream areas), low quality grazing (for survival of sedentary livestock), as a buffer zone between villages, or as an attractive area for tourists (e.g. sand dunes)
- The historical reference situation, the scale of assumed degradation and the expected (or proven) resilience of the land.

25 Based on universal criteria for land degradation, the Global Assessment of Soil Degradation (Oldeman et al. 1993) estimated that in Sub-Saharan Africa about one-third of croplands and pastures are moderately to severely degraded. It is unclear to what extent this finding corresponds to the perceptions of local land-users.
In many cases interpretation by ‘outsiders’ as regards a situation being degraded have been incorrect\textsuperscript{26}, and correspondingly predictions about people having to emigrate or starve have not come true. Similarly, the successful cases of land-use intensification (section I.3.3) were not predicted. For instance, for Machakos in the 1940s dramatic predictions were made about land degradation, and for upland areas at Java (Indonesia) in the 1970s desertification was predicted, while in both cases now both population density and tree cover are higher. In both areas much scientific research had been carried out about the ecological resource base and livelihood systems. These fortunate failures appear to be based on incorrect interpretations of:

- The resilience and ‘carrying capacity’ of the area and its environmental functions
- The diversity and resilience of local livelihood systems, particularly the inputs from supra-local level that are part of the land-use system
- The dynamic interactions between these two components, whereby under certain conditions land can be rehabilitated and made more productive under increasing population pressure.

More important, however, seem to be the underlying motivations. There are, for instance, different motivations to apply LEISA techniques, many of which are not in line with objectives of promoting sustainable land-use (section I.3.2). Outsider interpretations are often based on political motives and their own specific belief systems. In one historical period negative predictions about expected land degradation were used to justify external interventions and paternalistic approaches (the ‘degradation narrative’). At a later stage success were required to give a positive view on development aid and developing countries, and to demonstrate that developing countries can manage by themselves (the ‘self-correcting narrative’).

5. Rather than looking at design as a one-time event, we should think of an iterative process of monitoring and adaptation, focusing at key factors and sustainability goals. Both environmental aspects (multiple environmental functions at a large scale and long-term perspective) and social equitability aspects are important.

It has been stated that sustainable development is a continuous process, not aiming for a one-time solution, but incrementally improving and learning (section 2.3.1). All the case studies seem to have contributed to sustainability in some respects, although much remains to be done. When dealing with these issues, it is important to have a clue about the perceptions and long-term vision that is at the basis of certain developments and interventions. In the Machakos case, like in most other cases in developing countries, the sustainability focus seems primarily based on socio-economic development goals (of increasing productivity to feed growing populations and benefit from urban markets). The question remains how other sustainability issues, as indicated above, fit or do not fit in this vision, and what is the long-term perspective for the area as a whole.

With respect to environmental sustainability, the case studies mainly deal with issues of sustainable use of some environmental production functions, related to objectives of agricultural land-use mainly. For instance, the claimed sustainability of the Machakos case (section I.3.3) is primarily related to the successful application of soil conservation activities. This focus has a socio-economic rationale, as soil conservation is a key to increase crop production and incomes. But little if anything

\textsuperscript{26} For the communal areas in Zimbabwe since the 1920’s policy makers and scientists have claimed immediate risks for serious land degradation, while presently the state of affairs is still not dramatic (Campbell, 1994). For Sukumaland (Tanzania), the optimum population density in 1945 was estimated at about 40 per km\textsuperscript{2}, while in 1990 it was up to 100 km\textsuperscript{2} without dramatic degradation occurring (Meertens et al., 1996).
is said about other environmental qualities, like soil quality, agro-diversity, forest cover, wild biodiversity, water quality etc. Thus, sustainability in this case does not have a holistic validity. Among many development workers there appears to be an optimism that induced innovation will occur everywhere, sooner or later, which I cannot see being supported by concrete evidence.

With respect to social sustainability doubts remain about the equitability aspect. It appears that certain individuals benefit most from land rehabilitation in the Sahel region (section I.3.1), women often provide most of the labour associated with LEISA techniques while not deriving the benefits (section I.3.2), while economic development in Machakos region (section I.3.3) is accompanied by a polarization of wealth and a decline in overall food self sufficiency (Murton, 1999). In Machakos successful intensification on richer farms goes hand in hand with the opposite path of involution on poorer farms, and similar experiences were found in Uganda (Murton, 1999) and in the Sahel region (FAO, 1996; Gray and Kevane, 2001). One might wonder whether this can be avoided, since there will always be differential starting positions (in terms of resources, knowledge, networks, etc.), and innovators who are able and willing to take risks and gain major benefits before others follow. However, where ecological resources are scarce and/or economic opportunities are limited, ‘followers’ will often find themselves in a position where they cannot follow the same route. This is also the case where profitable markets are limited.

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27 Tree cover is stated to have increased, but whether these are biodiversity-poor Eucalyptus plantations or biodiversity-rich natural forests is not clear in the various publications about this case.
28 Likewise, environmental sustainability and degradation are interpreted in the narrow sense of ‘sustainable use’ by most works on agricultural change and innovation (e.g. Hyden et al., 1993).
29 There is sometimes an appalling lack of ecological knowledge among those claiming that land-use changes are sustainable. For instance, Gray and Kevane (2001) claim that the land-use changes in south-west Burkina Faso are environmental sustainable simply based upon the number of trees on agricultural fields.
30 Rural households can be stated to have objectives of productivity, stability, sustainability (or resilience) and equitability (Martin, 1988; Conway, 1994). Equitability describes the pattern of income distribution.
I.3 THE FOREST CONVERSION PROCESS IN INDONESIA

I.3.1 THE CASE STUDY

Context

Tropical forests represent important terrestrial ecosystems. While housing between 50% and 75% of the world’s biodiversity, tropical forests also fulfil important economic, social and spiritual functions to mankind, functions that can be sustained when forests are carefully managed. Approximately half the area that was once covered by tropical forests remains today. The rate of loss has been particularly high in the last 25 – 50 years. Between 1975 and 2000, approximately 370 Mha of natural forests were deforested in the tropics, mostly for commercial and small-scale agricultural expansion.

Indonesia still represents one country with a major amount of tropical forest left, with 110 Mha in 1990. In the past decades much attention has been given to logging (for timber) as the major activity that causes decline of primary forest. It has lead to the development of sustainable forest management practices, and certification of timber based on sustainable management principles. However, there are many other causes of forest decline. One of these are wide-spread forest fires. During the last El Niño, in 1997/98 in Indonesia at least 3.3 Mha of tropical forest burned. It was estimated that oil palm plantation owners started more than 50% of these fires. This emphasised the fact that nowadays in Indonesia most primary forest is being lost for purposes of clearing for oil palm plantations. While international pressure has lead to increasingly stringent regulations for selective logging, forest clearing for oil palm plantations is tied to less stringent regulations, and allows one to access the standing timber and establish a profitable plantation. It is estimated that in 2000 forest conversion accounts for roughly 40% of Indonesia’s legal timber and pulpwood supply (Barr, 2000).

Following these insights, there has been increasing attention to tackle the problem of forest conversion. This case study is based on a paper written by Kessler and Wakker (2000) for WWF Switzerland, on forest conversion and the edible oils sector in Indonesia.

Defining the forest conversion process

First of all, there is need to define what forest conversion really is. In most available literature on deforestation the term forest conversion refers to the gradual transition from forest to man-made forest (plantations) or non-forest land-use. According to FAO, forest conversion is defined as the transition from closed forest to agro-industrial plantations (tree plantations, including oil palm, rubber, coconut, etc.) and would not be classified as deforestation. This definition does not capture the intermediate phases, from logging, clearing, planting to early establishment and maturation of a non-forest plantation, which are all part of the forest conversion process. Kessler and Wakker (2000) defined forest conversion as a continuous process of declining forest functions, with intermediate stages of forest degradation and forest fragmentation. It ultimately leads to man-made monocultures characterised by the almost complete loss of the ecological functions that are typical for tropical forests, and the loss of socio-economic benefits for local people. The ecological transition involved has a highly irreversible character31.

The forest conversion process can be described by four different stages, each with its characteristic features and actors involved, and is visualised in Figure I.3:

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31 This definition is in line with the definition of deforestation by Van der Top (1998), to describe the range of activities leading to degradation of tropical forests: “A human-induced or natural reduction in – or even the complete removal of – tree crown cover in a given natural forest area over a given period of time”.
1. **Primary or mature (natural) forest.** This stage is characterised by closed canopy cover, little human influence, possibly low intensity / extensive use by indigenous communities, e.g. exploitation of non-timber forest products. There are no significant changes in forest functions and forest regeneration capacity is optimal.

2. **Logged or residual or secondary forest.** Road construction is often the first industrial activity in the primary forest, followed by the entry of logging companies to log selected valuable timber species. This stage provides the most high value timber from the tropics. A partially degraded logged over or residual forest remains. Natural restoration processes are still largely intact, although preferred timber species might be rare. Secondary forests provide little commercial timber, but still provide many forest products, have a high biodiversity and sequester large amounts of carbon. Commercial hunting pressure tends to increase significantly. Along logging roads total forest clearance, soil erosion and shifting cultivation may be observed.

3. **Conversion forest.** Following selective logging, local or migrant settlers colonise the area, and undertake forest clearing for subsistence (small-scale) or commercial (large-scale) agricultural purposes. Wildfires are deliberately started as a cheap way of clearing forest. Relatively stable semi-indigenous subsistence agricultural and mixed agropastoral systems may occur. A patchy pattern appears with remnants of residual forest, many small-scale and some large-scale clearings. Natural restoration processes are intact to some extent, but loss of biodiversity has occurred.

4. **Converted forest or non-forest stage.** The last remaining forests are completely cleared, usually by large scale land-owners or companies. Significant loss of forest functions occurs (e.g. loss of biodiversity). The landscape transforms from a patchy pattern to large scale agro-industrial monocultures. This might include land-use for ranching, tree-crop plantations, annual crops, pulp wood plantations, etc. which may be introduced within a certain sequence (e.g. rubber being converted into oil palm, ranches being converted to soybean). Natural restoration processes are largely destroyed, shifting back to (natural) forests requires major investments.

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*Figure I.3: The different stages of the forest conversion process in Indonesia (Kessler et al., 2001)*
One can recognise the geographic pattern of these stages from the air while flying from an urban centre to a forest rich region. There are frontiers characterising the transitions from one stage to another: the logging frontier (from stage 1 to 2), a colonising frontier with mixed activities (stage 2 to 3) and an industrial agricultural frontier (from stage 3 to 4).

In this conversion process, there is a decline of biodiversity, mainly in phases 3 and 4, and a decline of resilience due to loss of ecological forest functions, such as soil protection, micro-climate stabilisation, maintenance of water balance and decline of biodiversity (plants and animals playing a key role in regulating processes). Both stages 2 and 3 could be managed properly with maintenance of forest resilience and most biodiversity: stage 2 as a sustainable forest management system, stage 3 as an agroforestry farming system, with subsistence objectives mainly. Stage 4 could be managed sustainably, but as a result of loss of natural resilience and biodiversity, requires high management inputs to maintain productivity and stability of desirable production functions (e.g. pest control, soil protection, soil fertilisation).

Apart from the ecological impacts, there are serious socio-economic impacts, including:

- Loss of (the variety) of income opportunities in livelihoods of local peoples, such as from NTFPs, eco-tourism, (potential) medicinal products. Limited labour opportunities are provided mostly to migrants; local communities benefit less, get low wages and poor social services.
- Dispossession of customary land rights by local people, and of benefits derived from their use.
- Increasing vulnerability of local economies: as whole regions become dependent on a single crop which supply unpredictable global markets, local economies become vulnerable.
- Health impacts by smog from fires, pollution, floods, change in micro-climate (drought), loss of nutrition and diversity of forest products.
- Increasing inequity as industry leaders who are associated with corruption and nepotism lead the company groups that expanded in recent years, and strongly influence local politics.

**Palm oil plantations as a main driving force of forest conversion**

In Indonesia, rapid expansion of oil palm plantations started from 0.6 Mha in 1985, to 1.0 Mha in 1990 and almost 3.0 Mha in 1999. There are indications that in Indonesia the annual rate of conversion will increase sharply.

1. By 1995, an aggregate area of 20 Mha was applied for release of forest land to be converted, a figure which is said to continue to rise under the post Soeharto Government to 40 Mha, of which about 9 Mha has by now been released (Potter and Lee, 1999).
2. Several policy changes allow forest conversion to support the nation’s pulp and oil palm industries, to generate foreign revenues. This can be considered as a response to the high profitability of oil palm plantations and pulp plantations, and the increasing land pressure.

Due to increasing land scarcity and in order to meet land applications given for oil palm, forest conversion increasingly occurs:

- Selectively on the best soils (previous lowland forest) leading to fragmentation of forests and disruption of important wildlife corridors.

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32 A new legislation to favour the development of plantations allows ‘non productive production forests’ to be transformed to agro-industrial plantations when containing less than 20 M3 of timber per ha, and it allows plantation development on 30% of production forest estates. This would imply a transition from permanent forest estates towards agro-industrial plantations (Casson 2000).
• Increasingly in fragile areas with less suitable conditions for oil palm (peat swamps, steep slopes, flood prone areas and water catchments), causing land degradation and low yields
• In timber production forest (permanent forest estates) and in areas designated for conservation.

These trends underline the importance of the oil palm plantation sector in terms of a driving force towards forest conversion and large-scale forest landscape dynamics in Indonesia. While in most literature the logging and colonisation frontiers and their interaction are generally recognised, the profitability of agro-industrial monocultures constitutes a driving force behind the forest conversion process that does not seem to be fully recognised. The agro-industry drives the forest conversion process in at least three possible ways:
• By clearing natural primary forests (stage 1) directly, thereby possibly also benefiting from the valuable timber, and thereby skipping the intermediate stages
• By occupying logged land and land previously allocated to permanent forestry (stage 2), thus forcing timber exploitation to penetrate deeper into the primary forest
• By occupying land used for small scale agriculture and ranching (stage 3), thus forcing farmers and ranchers to clear secondary or primary forest.

No matter which of these transitions is most important, due to the interrelations between the different stages and the cumulative effect of various pressures on scarce (forest) land, land occupied for agro-industrial purposes directly or indirectly pushes the forest frontier zones further into the primary forest. The scale involved and the rapid speed of forest conversion is without precedence. This can be explained by the connections with global commodity markets.

Key factors and actors involved in forest conversion
The following factors were found to stimulate the forest conversion process by the oil palm sector.
1. Ecological factors: presence of large areas with good soils and climatic conditions for oil palm, presence of intact forests allowing timber exploitation to finance oil palm plantation establishment
2. Economic factors: high world-wide demand of edible oils with palm oil rising fastest, attractive prices, highly elastic demand for palm oil
   At local level: low levels of income and cheap labour availability. At national level: currency devaluation, export subsidies, policies to generate foreign revenues as a result of structural adjustment programs.
3. Socio-economic factors: low levels of organised opposition by local communities, low levels of literacy and access to information, suppression of local opposition, weak NGOs network
4. Institutional factors: easily acquired rights to use forest and land resources, flexible legal systems and formal regulations, weak enforcement of forest legislation, no adherence to good governance, high levels of corruption at national and local levels, decentralisation of policy making.

33 Total global palm oil consumption is expected to increase by 50% the coming years, due to the combination of a strong population growth in developing countries and an increase in wealth (e.g. WWF / MPO, 2000). Palm oil is set to become the most produced, consumed and internationally traded edible oil in the world by 2012. Palm oil has the highest productivity of vegetable oils in terms of the yields of oil per hectare, 5-10 times as much as soy oil. Apart from that, palm oil is difficult to mechanise, and will continue to depend on high labour inputs. If labour wages increase and prices will fall, the cost advantages of palm oil will decline (Stringfield, 2000).
Figure I.4: Multi-level and multi-sector analysis of actors in the forest conversion process

This is not an exhaustive list of the factors involved. To acquire a complete overview of all factors involved would be part of a systems approach. Based on this preliminary overview of key factors, an actors approach of ‘progressive contextualisation’ (section 2.4.3) was applied to identify the key actors and critical factors determining the forest conversion process. As a result, four sets of associated key actors can be identified in the forest conversion process (Figure I.4). These actors can be found within interacting social systems at local, regional, national and international levels and their motivations in relation to forest conversion may be positive, neutral or negative (Table I.4).

1. **Public sector**: For political decision-makers at national and local levels and landowners, their legal and economic policies aim to support forest conversion. There are both economic motivations (profitable and growing markets) and non-economic motivations (e.g. opening up forests, dispossessing local communities, favouring private investments). Even if the financial profitability would decline, policies stimulating forest conversion can therefore be expected to persist.

2. **Private sector: oil palm commodity**: There are companies involved in trade, processing and retail of palm oil products. Key players on the international market can ‘make and break’ the producers. Their decisions are primarily determined by international commodity prices and consumer demand. Depending on their size, the clients of edible oils traders such as supermarkets may have considerable influence on the traders. Decisions by investors are driven by opportunities and limitations set by the market, financial obligations and government regulations.
3. **Private sector: Financial institutions.** The expansion of oil palm estates in Indonesia is in large part financed through commercial loans provided by financial institutions from Asia, Europe and the United States. Depending on the type of credit provided, financial institutions can be in a solid position to influence their clients’ policies.

4. **Civil society.** Civil society represents opposite interests and attempts to promote forest conservation rather than conversion. Civil society groups often find their concerns are not addressed by Government. As a result there is social unrest, and conflicts on plantations. Civil society can find allies amongst actors at higher levels, e.g. human rights or environmental NGOs.

From this analysis, it is clear that the expansion of Indonesia’s oil palm sub-sector is primarily the result of a deliberate political choice. It is not caused by uncontrollable socio-economic and demographic factors. These conclusions are in line with those from the study by Barraclough and Ghimire (2000) on agricultural expansion and tropical deforestation.

The four sets of key actors at different levels (from international to local levels) strongly interact and together seem to form a tightly knit complex. To gain insight in this network, the ‘resource-trade-cycle’ model (Kessler et al., 2001) describes how consumer markets are related to resource management / forest conversion processes (Figure I.5). There are two basic flows that connect consumer markets with the resource: capital flows and product flows. Capital is channelled to the producer through financial institutions. The producer’s products are channelled to the consumer market by a range of actors in the chain-of-custody. The consumers through their savings contribute to create the financial resources that feed the process. So far, the model represents a basic free trade mechanism. There are external parties that can influence the actors in the central axis of the trade network (in a positive or negative sense), most notably governments and NGOs. For each of the four components, the key actors for the case of forest conversion in Indonesia were identified.

![Figure I.5: The Resource-trade-cycle model. For each situation concrete actors should be identified.](image-url)
Levers and opportunities for change
The next step is to identify opportunities for positive change within this network of key actors that cause forest conversion, and then determine which are good starting points for solution strategies. An overview has been given in Table I.4.

Table I.4: Key actors associated with forest conversion by the oil palm sector, with present motivation and opportunities for positive change

<table>
<thead>
<tr>
<th>Key actors</th>
<th>Present motivation</th>
<th>Opportunities for positive change</th>
</tr>
</thead>
</table>
| Plantation and land owners and companies and corporate groups | Investment and management plans for quick profits through large-scale conversion | • Reduce risks on marginal lands (by flooding, pests) and by price fluctuations, through income diversification (e.g. tourism, certified timber, non-timber forest products)  
• Intensify oil palm productivity through ‘best practices’ |
| Local and regional governments          | Policies aimed at short-term economic benefits                                     | • Avoid social unrest, acquire assistance from donors and other foreign investors for sustainable development activities  
• Reduce risks by generating incomes through a diversity of economic activities, create employment on a sustainable basis |
| National governments                    | Legislation and policies to stimulate export earnings, increase power and control  | • Maintain credibility among donor / global community  
• Attract responsible investments  
• Maintain multifunctional forest resources |
| Edible oils retailers                   | Go for the cheapest producer countries and management options                      | • Maintain credibility among consumers, e.g. through certified palm oil products based on ecological and social criteria (EKO products) |
| Financial institutions                  | Provide financial resources that allow investments to be made for highly profitable investment opportunities | • Reduce current risks of investments due to social unrest, poor company management, environmental degradation and legal cases  
• Improve credibility among consumers and clients, acquire a ‘green profile’  
• Improve diligence through social and environmental investment criteria |

A key mechanism to tackle the forest conversion problem can be through the financial institutions, to divert the current financial inputs to unsustainable forest conversion processes towards more sustainable forest management and agricultural development options. This change would be based on both non-economic (emotional) rationale (the growing motivation of financial institutions and their clients in western countries to develop a ‘green profile’), and economic rationale (long-term economic prospects of more sustainable land-use, in view of the perceived environmental and social consequences of unsustainable practices).

To operationalise these solutions, there is also need for a spatial picture. This might be related to the 4 stages of forest conversion (Fig. I.3):
Stage 1: Achieve the protected status of remaining areas of primary forest, possibly with financial compensation schemes and involvement of indigenous communities.

Stage 2: Investments in forest restoration, which may in part be financed by sustainable extraction of non-timber forest products, ecotourism, carbon sequestration or other small scale economic activities.

Stage 3: A buffer zone with sustainable land-use (e.g. agroforestry systems) and large-scale or community based forestry under FSC-certification. Apart from initial investments in forest restoration, this area could probably become financially self-sufficient.

Stage 4: Transformation into a landscape with diversified agriculture, mixed plantations and restored forests. This requires investments but will eventually prove more sustainable.

**Partnerships with private sector**

Several activities were initiated to tackle the problem of forest conversion in Indonesia, partly as a result of this study. Based on mutual interests to develop more sustainable strategies (Table I.4), and the building of strategic partnerships between environmental NGOs and interested parties from private sector, the activities being undertaken focus at three components of the private sector involved.

1. *The plantation owners.* There is much variation among oil palm plantation owners in terms of applying environmentally sound practices, at management unit level (e.g. organic fertilisation), and at landscape level (e.g. not clearing sloping land). An inventory of ‘best practices’ among oil palm plantation owners aims to identify innovators and establish a set of practices. This will lead to the development of a package of practices that are economically attractive and environmentally more sustainable. Best practices are based at reducing costs (e.g. not clearing peat swamps that are vulnerable to flooding and crop damage), and/or at creating new opportunities (e.g. proposing alternative land-use options for fragile soils, like sustainable forest management to produce certified timber, growing rattan, allowing hunting or ecotourism on plantations).

2. *The international oil palm traders.* Negotiations with oil palm traders are started to develop a ‘green oil’, i.e. palm oil that has been produced under agreed upon criteria for environmental sustainability, including first of all that it has not contributed to decline of primary forest. This option is based on the growing environmental awareness among consumers and therefore the expected future advantage of producer companies to develop a ‘green image’.

3. *International banks.* Negotiations are undertaken with banks in Western countries that are involved in financing forest conversion for oil palm plantations in Indonesia. An elaborate study was undertaken to provide evidence on this involvement (Wakker et al., 2000). The aim is to help banks develop sustainability principles (both social and environmental). To convince banks, a campaign was started to put pressure on banks, by informing shareholders and customers about the negative environmental and social impacts of their funding strategies. At the same time support is being given to banks that are willing to collaborate.
I.3.2 DESIGN IMPLICATIONS

1. Insight is required in the sectors that constitute driving forces for environmental changes. Root causes are often found in sectors beyond the traditional conservation agenda (e.g. agricultural sector instead of forestry only), and involve actor networks at international, national and local levels. Instead of analysing in detail sub-systems (of one sector and/or one level), the focus of an efficient design process should be at critical knots and levers.

A world-wide study on the effectiveness of forest policies showed the increasingly important role of national and multinational private companies influencing the forestry sector. Many of these go for short-term asset stripping (Mayers and Bass, 1999). This is an economically rational business response to prevailing market forces and existing national policies. In most developing countries the role of the state has been downscaled, partly as a result of structural adjustment programmes, and forest policies are weak or not enforced. As forest companies increase in size, and become multinational companies, they develop greater opportunity to influence national or local policies. While this can create powerful entities that deliberately pursue unsustainable policies, the increasing power of private companies also constitutes an opportunity. There are companies with long established track-records of fair management, decent environmental reputation and positive contributions to local and national development. The challenge is to stimulate these initiatives, and to create an enabling context for these initiatives to become more feasible and attractive.

The case study demonstrated that key forces and private sector actors driving the forest conversion process in Indonesia are also found outside the forestry sector. For production of edible oils, for which a highly profitable world market exists, fertile tropical lands are required, and therefore tropical forests must be cut. In other parts of the world, markets for meat, oil, tourism etc. determine such pressures.

2. Spatial patterns at landscape level are useful to understand the large-scale dynamics of change processes, and constitute a powerful visual image to raise awareness. The spatial patterns show the main development frontiers, threats and driving forces in a qualitative manner. These patterns can be better understood when placed in a historical perspective of changing attitudes and economic development stage.

It has not been easy to create general insights in the causes of deforestation. Rudel and Roper (1997) made a study of a considerable data set on deforestation, population densities and other parameters, from a range of countries. They showed that underlying causes and dynamics could be better understood if the large data set was split into two components, one of deforestation of relatively large forests, and one of small forest areas. The resulting model in fact describes two deforestation frontiers, with different sets of driving forces and actors involved:
- The ‘logging frontier’, by which largely intact forests are affected. Here, entrepreneurs bring together capital and form coalitions with companies and landless labourers to build roads and open up the forest. This is triggered by external markets and the presence of natural resources that can be extracted in a profitable way (for timber, agriculture, extensive grazing). It is made possible by the availability of capital (e.g. during economic booms), flexible policies and cheap labour.
The ‘colonisation frontier’, by which small fragmented forests are being cleared. Here, small patches of forest are cleared for subsistence purposes, by shifting cultivators and migrants. This is triggered by population pressure, land scarcity, poverty and the lack of income opportunities, and it is made possible by the fact that the forest has been opened up and made accessible.

These two processes may occur simultaneously at different places in one country, and generally occur in a historical sequence. This model should be specified for each situation, as was done for the case study (Fig. I.3). The case study on forest conversion in Indonesia also includes the ‘intensification frontier’. Forest conversion processes for large-scale agriculture actually skip the second frontier, but directly move from ‘logging’ to ‘intensification’. Small-scale farming or indigenous communities have no place in this process.

Eventually, of course, forest conversion and deforestation will come to an end, as there is growth in alternative economic opportunities, migration to urban areas, and remaining forests are too inaccessible or too poor quality for cost-effective exploitation (Rudel and Roper, 1997). There are also legal barriers to continuous forest conversion though these tend to be weak.

3. In view of the complexity of environmental problems, with complex interactions of factors at multiple levels and actors from multiple sectors, it is not useful to analyse in detail the (sub-) system/s. Instead a more pragmatic and action-oriented approach should be taken, which focuses at an overall insight and then identifying the knots and levers in the system.

The past decades many studies have been undertaken to understand the causes of forest decline, in order to define appropriate solutions and forest management strategies. As a result, attention has shifted from direct causes to indirect, underlying or root causes, and from local agents to key actors at policy levels and within private sectors. Addressing root causes and key actors might lead to more structural solution strategies than tackling local symptoms. The ideal is, of course, to find the root cause, and the key actor, which, if properly addressed, would solve the problem, or at least make a very significant difference. This appears to be difficult to achieve, because (Contreras-Hermosilla, 2000):

- There are rarely linear or unidirectional cause-effect chains, but usually complex multi-causal chains and feed-back loops
- There is often confusion as regards what is causing what (‘chicken-egg’ type of discussions)
- There is much variation between different localities and periods, so what is true at one place and moment in time, cannot be extrapolated in time or space.

This conclusion is not surprising given the earlier insight that ecosystems are complex, and even more so when involving human actions (section 2.4). A review of some studies on root causes, for biodiversity loss (Wood et al., 2000), for deforestation (Contreras-Hermosilla, 2000), and for agricultural expansion and tropical deforestation (Barraclough and Ghimire, 2000), leads to the following conclusions:

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34 A distinction can be made between shifting cultivators, as indigenous communities that practise shifting cultivation, and migrant settlers or ‘shifted cultivators’ (Myers, 1980). While shifting cultivators are affected by forest conversion, they are not intrinsic part of it. Shifted cultivators are either pushed or pulled into forest areas, often by making use of logging roads or stimulated by government backed settlement schemes.
The underlying dynamics of environmental problems are complex and there are no simple relations or solutions; the ‘success’ of one policy measure depends upon other contextual and policy factors. Generalisations may be helpful as working hypotheses in understanding the complex underlying dynamics, but there is need to be specific for each situation, to identify specific causes and actors. The complex dynamics are often the result of a chain of decisions made at different spatial levels, with outcomes that are difficult to predict. Solution strategies should therefore engage actors at multiple-levels (from local to international).

These conclusions, however, risk to lead to inertia because ‘everything is so complex’, or to extensive analytical studies to detect all the ins and outs of complex systems. However, this case study shows that it is possible to start implementing some promising actions at a relatively early stage. Basically the following steps can be followed:

- Acquire overall insight in what is going on, find the key factors (driving forces) and actors influencing the main process of change (through ‘state-of-the-art’ studies and inventories).
- Acquire insight in interactions between sectors and key actors at different levels, in spatial patterns (at landscape level) and in historical trends and dynamics.
- Using these insights, adopt progressive contextualisation to identify knots and levers in the causal chains. Levers include opportunities for change based on insights in current motivations and mutual interests of key actors.

4. During design processes special attention should be given to identify opportunities for change, in terms of promising initiatives and innovative actors. This requires an eye for the exceptions rather than the normal and average.

Environmental problems often show amazing persistence, even when rational insight demonstrates that the prevailing situation is not desirable from several points of view. Patterns tend to repeat themselves while one would expect changes to take place. This is related to difficulties for people to change their established attitudes and accept a new paradigm. However, there are always exceptions to the rule, of initiatives being taken by exceptional people or organisations, with a promise for change. One principle of early actions is to start working with actors that show motivation to change. These can be considered as innovators, and they might be the key for influencing others to change. Provided adequate support is given, innovators will set successful examples for others to adopt.

35 In complex systems terminology this can be referred to as ‘attractors’. These are patterns (comfort zones, equilibria) that meet a range of desirable objectives and motivations of people. They are difficult to change.
I.4 STRUCTURAL ADJUSTMENT PROGRAMMES AND THE ENVIRONMENT

I.4.1 THE CASE STUDY

Context

Structural Adjustment Programmes (SAPs) are designed to reform economies to a more export-oriented and liberalised market economy while down-sizing governments that have become inefficient bureaucracies. They consist of combinations of exchange-rate policies, monetary and interest policies, fiscal policies, trade policies, public-sector policies and institutional policies (Opschoor and Jongma, 1996). Initially, SAPs were solely intended to modify the structure of an economy so that it can maintain both its growth rate and the viability of its balance of payments in the medium term.

Several studies and reviews have appeared on the impacts and consequences of IMF/World Bank-inspired SAPs on social issues, on the environment and on sustainable development (Abaza, 1996; Opschoor and Jongma, 1996; Reed, 1996; Engberg-Pedersen et al., 1997).

Table I.5: Summary of environmental impacts of structural adjustment programmes

<table>
<thead>
<tr>
<th>Positive impacts</th>
<th>Negative impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Removal of perverse subsidies discourages use of chemical pollutants; stimulates more efficient use of scarce natural resources</td>
<td>• Export promotion stimulates high-input cash-crop farming with little attention for sustainable practices</td>
</tr>
<tr>
<td>• Greater economic and price stability promotes sound resource management</td>
<td>• Trade liberalisation boosts investments in extractive sectors</td>
</tr>
<tr>
<td></td>
<td>• Price changes and removal of subsidies on basic commodities leads to an increased burden on the poor, increasing their dependency on natural resources</td>
</tr>
<tr>
<td></td>
<td>• Dismantling of environmental management institutions</td>
</tr>
</tbody>
</table>

It is concluded that the impacts of economic policies and reforms on the quality of environmental assets shows great variation (Table I.5), and there is not sufficient understanding of the relationships between the economic policy measures and the resulting environmental impacts (Abaza, 1996; Opschoor and Jongma, 1996). This is due to a number of factors.

1. The variable context in the countries concerned, as regards ecological factors (e.g. production potentials, ecosystem fragility, level of degradation), socio-economic factors (e.g. dependency on natural resources, population pressure, rate of urbanisation), and institutional factors (e.g. existing legislation).

2. The uncertainties as regards the interaction between the various effects of SAPs, both direct and short-term (e.g. deforestation for increased revenues) and indirect and long-term (e.g. changing income distribution).

3. The variable occurrence of major disturbances, such as environmental shocks (e.g. drought, floods, hurricanes), economic shocks (e.g. economic crisis, world market prices) and social shocks (e.g. political unrest).

4. The variable history of SAPs and paces of implementation, and the variable package of SAP measures implemented in different countries.
**Box I.1: Example of an assessment of SAP measures on the natural resource soils**

In many tropical countries, there are risks of soil degradation as a result of soil depletion in extensive agricultural systems. Some underlying key factors are poverty, high dependence on local natural resources for subsistence food production, low budgets for the agricultural extension service and high costs of external inputs such as fertilisers. Related to this insight, relevant pressure and response indicators were defined. The concurrence of the trend lines of increasing land degradation, declining fertiliser consumption, increasing consumer price index and implementation of SAP measures gives strong indication for a relationship between SAP measures and (existing and future) soil depletion. In many tropical countries the assessment of the current soil qualities shows that further depletion may cause changes with serious long-term socio-economic consequences.

Due to the great variation in outcomes of the environmental impacts of SAPs, it is difficult to draw firm conclusions. However, most studies agree that the net result is that of negative environmental impacts exceeding positive impacts (Abaza, 1995; Munasinghe and Cruz, 1995; Opschoor and Jongma, 1996; Young and Bishop, 1995). Policy-makers tend to disregard such conclusions as not being based on quantitative data and analysis, or being not sufficiently specific. WWF initiated in nine adjusting countries studies on the impact of SAPs on the environment (Reed, 1996). It took the economic measures as a starting point. This case study is on the analysis of the nine country studies from an environmental perspective, with a cross-sectoral analysis of the impacts by SAPs on the quality of three natural resources: soils, water and forests (Kessler and Van Dorp, 1998).

**Methodological framework**

Determining the environmental impacts of SAPs is not simple. Opschoor and Jongma (1996), on the basis of a review of several studies, conclude that due to the existence of various evaluation methods (before-after comparisons, actual-target comparisons, control-group approach, general equilibrium models), it is difficult to compare different studies. This is mainly due to the absence of an analytical assessment methodology (e.g. to deal with the sources of variation mentioned above) and the scarcity of reliable quantitative data. As a result most studies lack objectivity and focus on short-term consequences (AIDEnvironment, 1997).

The methodology developed for this study takes natural resources as a starting point to assess the impact of SAP measures. It consisted of four components (Kessler and Van Dorp, 1998; Figure I.6).

1. Elaboration of the multiple functions of each natural resource (including production, regulation and signification functions, see section 2.1), and the major use categories. Then, for each resource key indicators were defined to assess the quality of the main functions.
2. Assessment of the current state and trends of the main environmental functions per resource, using selected state indicators. Trends were compared with norms or thresholds if available (e.g. sustainable yield, risk of species loss, degradation processes).
3. Assessment of the pressures on the environmental functions, using trend lines of selected pressure and response indicators, based on insights in the key factors (social, economic, institutional and ecological) determining resource use.
4. Assessment of the impacts of SAPs on the environment by determining how SAP measures have influenced, or will influence, key pressure or response indicators. A quantitative approach compared the chronology of indicator trend lines with the chronology of economic and social changes directly associated with SAP measures. A qualitative approach used case studies and logical reasoning on relations between SAP measures and indicators. See Box 1.1 for an example.
Results
Some results are presented in table I.6. It shows to what extent changes in pressure trends are being influenced by SAP measures, and how these changes affect social groups and natural resources in certain areas.
Table I.6: Some results of a study on the environmental impacts of structural adjustment (SAP) measures in several countries (see text for explanation) (adapted from Kessler and Van Dorp, 1998).

<table>
<thead>
<tr>
<th>PRESSURE TRENDS</th>
<th>UNDERLYING INFLUENCES OF SAP MEASURES</th>
<th>SOCIAL GROUPS INVOLVED</th>
<th>AREAS INVOLVED</th>
<th>IMPACTS ON RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Area increase of food crops, particularly on 'marginal' soils, also around urban centers</td>
<td>deteriorated input-output price ratio, unfavourable marketing arrangements, removal subsidies, poor credit facilities</td>
<td>smallholders, high land pressure, low incomes, no alternatives, unemployed civil servants</td>
<td>widespread, low potential areas, 'marginal' soils, forests</td>
<td>-- 0 -- --</td>
</tr>
<tr>
<td>2. Area decline of food crops due to increased yields or emigration</td>
<td>improved opportunities for tradeable crops, rural emigration due to deteriorated rural opportunities</td>
<td>smallholders and commercial agricultural sector</td>
<td>uncommon, limited areas, mainly high potential areas</td>
<td>++ var var +</td>
</tr>
<tr>
<td>3. Area increase with 'erosive' crops, mainly annual crops</td>
<td>better opportunities for tradeable crops due to devaluation, trade liberalisation, privatisation, poor extension services</td>
<td>mainly commercial sector and relatively rich smallholders</td>
<td>high potential areas, good infrastructure</td>
<td>var var -- --</td>
</tr>
<tr>
<td>4. Reduced use of agro-chemical inputs</td>
<td>reduced subsidies on external inputs, deteriorated input-output price ratio, privatisation, higher transport costs</td>
<td>Low-extrenal input smallholders with poor resource base, High-extrenal input and commercial sector with good resource base</td>
<td>low potential areas mainly, irrigation sector</td>
<td>-- 0 + 0</td>
</tr>
<tr>
<td>5. Increased animal stocking rates in subsistence sector</td>
<td>increased dependency on livestock products (see 1); poor rural credit and savings facilities; reduced subsidies on commercial feeds</td>
<td>smallholders with poor food security, low incomes, lack of alternatives</td>
<td>low potential (semi-arid) agro-pastoral areas</td>
<td>- 0 - -</td>
</tr>
<tr>
<td>6. Increased commercialisation of livestock products</td>
<td>better opportunities for tradeable livestock products (see 3)</td>
<td>commercial sector pastoralists</td>
<td>pastoral areas in good condition (ranching)</td>
<td>var 0 - var</td>
</tr>
</tbody>
</table>

Legend: - and -- indicates negative impact; + and ++ indicates positive impact
<table>
<thead>
<tr>
<th>PRESSURE TRENDS</th>
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<th>SOCIAL GROUPS INVOLVED</th>
<th>AREAS INVOLVED</th>
<th>IMPACTS ON RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Reduced application of management practices of land, forests and water resources</td>
<td>decline of extension services and research due to budget cuts, poor credit facilities, poor land security</td>
<td>smallholders mainly, poor extension and social services</td>
<td>mainly in remote areas with poor information supply</td>
<td>Soil quality - depletion -</td>
</tr>
<tr>
<td>8. More efficient use of scarce water, energy, nutrients, land resources</td>
<td>see 5; high costs of energy and external inputs, water pricing and taxation of scarce resources</td>
<td>people with wide resource base and options to develop alternatives</td>
<td>so far limited, in urban and irrigation sectors mainly</td>
<td>Forest quality +</td>
</tr>
<tr>
<td>9. Intensified forest exploitation for subsistence needs</td>
<td>increased dependency on forest products for energy, poor land security (see 1, 5)</td>
<td>smallholders with poor food security, low incomes and lack of alternatives</td>
<td>low potential, remote areas</td>
<td>Soil quality pollution -</td>
</tr>
<tr>
<td>10. Increased hunting and trapping and fishing for commercial purposes</td>
<td>for subsistence and commercial purposes (see 1, 3); ineffective environmental legislation and law enforcement</td>
<td>illegal sector</td>
<td>forest ecosystems, both freshwater and marine fishing</td>
<td>Water quality 0</td>
</tr>
<tr>
<td>11. Increased reforestation and community forest management</td>
<td>Increasing energy costs making forest products more valuable</td>
<td>smallholder and commercial sectors, land security, good markets</td>
<td>mainly high potential areas</td>
<td>Forest quality +</td>
</tr>
<tr>
<td>12. Increased water concentration and use in irrigation and industries productive sectors</td>
<td>better opportunities for producing tradeables by irrigation and industries using water, no polluter pays principles</td>
<td>smallholder and commercial sector</td>
<td>areas with good infrastructure and markets</td>
<td>Soil quality depletion -</td>
</tr>
<tr>
<td>13. Decline of maintenance of sewage plants and waste treatment</td>
<td>Declining budgets for urban sector mainly state services, no support to build up decentralised management and control capacities</td>
<td></td>
<td>urban areas</td>
<td>Water quality 0</td>
</tr>
</tbody>
</table>

Legend: - and -- indicates negative impact; + and ++ indicates positive impact
From this overview, the following results can be highlighted.

1. Where farms use much external inputs, and in areas with high agricultural potentials, SAPs have positive environmental impacts. Here, reduced subsidies have led to less over-use of fertilisers, pesticides and machinery, and have thus increased their efficiency and stimulated the adoption of more environmentally sound practices such as Integrated Pest Management (IPM) and zero-tillage. The dismantling of inefficient parastatals due to SAP measures (e.g. cocoa board in Cameroon) also contributed to reduce pollution. However, where farms use few external inputs, and in areas with low agricultural potentials, the same SAP measures have negative environmental impacts. Here, reduced subsidies risk to cause soil depletion and deforestation for cropland expansion, as land-use intensification has become less attractive.

2. SAPs have stimulated the production of cash crops. This might trigger agricultural development through increased revenues, but it can also stimulate deforestation, excessive use of pesticides, water pollution and decline of soil stability. For cotton, the first (positive) development occurs in southern Mali, the second (negative) development occurs in El Salvador. Land tenure, agricultural extension, the diversity of the agricultural system and the value of forest functions for local communities appear to be key factors determining this outcome.

3. In some countries SAPs have stimulated rural emigration (through deteriorated agricultural input-output ratios and opportunities in urban areas) and thus reduced rural pressures but increased urban pressures (e.g. aggravating urban waste pollution). In other countries SAPs have stimulated urban emigration (due to increased urban unemployment) thus increasing rural pressures and encroachment on ‘marginal’ lands. Cultural and social ties, living standards and the relation between rural and urban incomes and social services appear to be underlying key factors.

4. SAPs have stimulated destocking and selling of livestock in the short term (due to devaluation and trade liberalisation) and thus reduced environmental pressures (e.g. in Mali). However, stocking and clearing of land for grazing in high potential areas has increased if land is easy to purchase and land management regulations are not put in place or are not respected (e.g. Venezuela).

5. In some cases tree planting and forest management has improved due to increasing prices for fuelwood and energy sources, mainly in urban centres. However, these initiatives focus on the productive properties of forests, and disregard regulation functions and biodiversity of forests.

6. SAPs have accelerated the use of water resources for economic sectors such as industries, mining, tourism and irrigation, e.g. by creating dams and reservoirs. These changes are beneficial for those with access to land and water (the ‘winners’) but harmful for many upstream communities (who cannot benefit) and downstream communities (by flooding and a disturbed water balance). A disturbed water balance will affect the life span of reservoirs and irrigation schemes.

The methodology has generated better insights on the causes of variation as regards the impacts of SAP measures on environmental qualities. There is a range of factors that will determine whether SAP measures, such as trade liberalisation and devaluation, will have positive or negative environmental impacts. Insight in these underlying key factors is essential to identify specific accompanying or mitigating measures (for social groups and ecosystems) in case of expected negative impacts and, more importantly, to identify strategies that will have positive environmental impacts.

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36 This example shows that one cannot simply speak of ‘erosive’ and ‘non-erosive’ crops (Barbier, 1991). The prevailing agricultural practices and the ecological context determine whether the crop is grown in a sustainable way. ‘Non-erosive’ tree crops can be grown in an unsustainable way (e.g. coffee or cocoa with excessive pesticides).

---
The following factors determine much of the outcome of SAP impacts on environmental resources:

• Ecological: production potentials and fragility (stability) of ecosystems and urban environments, thresholds of irreversible change
• Social: population growth rate, poverty, land tenure security, income and employment diversification, unemployment rate
• Institutional: research and extension services, available credit supply, decentralisation policies, law enforcement capabilities and application of the polluter-pays and the precautionary principles.

The following set of factors particularly causes negative environmental impacts of SAP measures:

• Relatively fragile, non resilient ecosystems
• Potentially high short term revenues from unsustainable resource use, highly elastic demand for derived products
• Scarce alternative income opportunities
• Poverty and high population growth
• Poor equity to access to natural resources and derived benefits

Overall impacts of SAP measures on sustainable development

The impacts of SAP measures on sustainable development were assessed by making use of the three key values introduced in section 2.2.4. This shows that most SAP measures:

• Stimulate functional procurement by the environment, often products for trade and export of natural resources;
• Generally have negative impacts on functional diversity, as production focuses at a limited number of products, even where regeneration or reforestation activities occur (as these also focus on a limited range of desirable products)
• Generally have negative impacts on resilience, as a result of reduced functional diversity, and the neglect of specific characteristics (fragility) of ecosystems.

SAP measures have socio-economic impacts, either directly, e.g. through staff or budget changes within management institutions, but also indirectly, through changed resource use and resulting changes in environmental qualities. These measures are often among the main root causes of unsustainable situations, by directly or indirectly stimulating unsustainable use of natural resources, particularly in resource-poor environments and for common property resources. Policy measures such as trade liberalisation and devaluation may have positive impacts at one place (by sustaining productive use and higher incomes) but negative impacts elsewhere (by stimulating ‘grab it and run’ behaviour and marginalisation of local residents). But as state management institutions are often downscaled (or even dismantled), and the development of alternative management institutions is not actively supported, environmental changes often lead to a dichotomy between ‘winners’ (those with a better starting position) and ‘losers’. Insight in resource-use systems and trends shows that social groups particularly affected are women, the landless, pastoralists and indigenous communities. In many cases the positive impacts are found among relatively rich social groups and in well-endowed areas, while the negative impacts are found among relatively poor social groups and in resource-poor environments (Kessler and Van Dorp, 1998).
I.4.2 DESIGN IMPLICATIONS

1. The methodology has potential to systematically integrate environmental issues into the design of plans or policies, by starting out from the resource base. To meet this potential, more and better information is required, either through case studies, or through information exchange processes.

To support sustainable development processes, an integration of economic adjustment, poverty alleviation and sustainable use of natural resources is necessary. A methodology is required that:

- Makes an integrated assessment in early phases of decision making, to help define policies at a sectoral and spatial level, and possibly define accompanying measures to avoid unacceptable social or environmental impacts
- Makes use and stimulates specific case studies per sector and/or region, with identification of key driving forces and key actors involved
- Helps establish a monitoring system focused at key issues, to adjust policies if needed.

From an environmental point of view, the methodology should pay specific attention to:

- Fragile ecosystems, critical ecological processes (stabilisation and regulation), biodiversity values, possible thresholds of natural resources and maximum sustainable yield levels
- The multi-functionality of the environment
- Vulnerable social groups and those that depend greatly upon the use of natural resources in their immediate surroundings
- Basic institutional and social services supporting the maintenance of environmental functions
- Unsustainable resource-use practices or systems and insufficient legislation and/or law enforcement capabilities (e.g. priced and taxed realistically to reflect present and future values).

The methodology for this study was developed to assess the environmental impacts of SAPs in a systematic way, and clarify the underlying causes (Kessler and Van Dorp, 1998). This is useful to develop more effective solution strategies, and accompanying measures with SAPs, but these considerations could also have been integrated in SAP designs. However, difficulties to apply the analytical rigour of the methodology were:

- The shortage of reliable data, particularly long-term data sets, state indicators of environmental qualities, and data on issues related to regulation, diversity and cultural environmental functions
- The absence of regional statistics, recognising that national statistics hide important regional variation and are often inadequate to understand specific dynamics
- The short period since major SAP measures were implemented (e.g. devaluation of the CFA franc only one year before the study was undertaken).

2. For every local situation an inventory of trends and driving forces at supra-local levels must be made, and impacts on ecosystems and social groups must be assessed. Although generalisations are useful to discern patterns, specifics are required to define local solution strategies.

Policy measures at higher levels are often among the main root causes of unsustainable situations, by directly or indirectly stimulating unsustainable use of natural resources. But the impacts can vary considerably (Table I.6). Policy measures such as trade liberalisation and devaluation may have positive impacts at one place (by sustaining productive use and higher incomes) but negative impacts elsewhere (by stimulating ‘grab it and run’ behaviour and marginalisation of local residents). The positive impacts often benefit relatively rich social groups and in well-endowed areas, while the
negative impacts are borne by poor social groups and in resource-poor environments (Kessler and Van Dorp, 1998). Standard packages of economic measures are not useful because variation within one country (between localities and in time) can be considerable.

There is often a multitude of root factors and causes involved. The following is a possible classification of relevant root causes (Wood et al., 2000): demographic pressures, poverty and inequality, poor infrastructure and social services, macro-economic change, trade relations, market prices, domestic and international policies, development bias, environmental management capacities. How these factors interact is to a large extent country-specific, with a number of economic forces working in different, sometimes opposite, directions (Contreras-Hermosilla, 2000).

3. **To assess large scale and long term patterns of change, the 3 key values of ecosystems for human society are useful: functional procurement, functional diversity and resilience.**

The case study showed that overall influences of SAPs are that of increasing functional procurement of a few products by export-oriented growth and ‘selling’ of natural resources, while reducing functional diversity and resilience of ecosystems and resource-based livelihood systems. While these changes can be productive at the short term, the loss of resilience has major long-term risks. In ecological terms, fragile ecosystems are most affected. In social terms, there are negative impacts on certain social groups, mainly those with relatively limited resources available, and SAP measures therefore often lead to a decline of equity.

4. **It is important to gain insight in belief systems and development paradigms that prevail among policy makers. The experiences and evidence upon which these belief systems are based might not be generally applicable and might differ from those of local stakeholders.**

Economic theory driving SAP measures is based on the assumption that declines of social and/or environmental qualities and values are acceptable negative side effects of economic reforms, and will be corrected once economic growth has reached a certain stage (section 2.3.4). There is evidence from developed countries that indeed environmental improvement (through restoration, rehabilitation and conservation measures) will take place once a certain level of economic prosperity has been reached. The general limitation of this theory, which is based on the concept of weak sustainability, has been discussed in section 2.3.4. The above study demonstrated through the methodology that was developed that this rationale does not apply to most developing countries, for two major reasons:

- Both social and environmental changes can be irreversible, such as the outbreak of diseases, social conflicts, uncontrolled migrations, loss of biodiversity, loss of soil by landslides, floods, etc.\(^{37}\)
- Based upon the positive correlation between per capita income and environmental improvement, and the current slow economic growth and high population increase in most developing countries, it will take long before in developing countries environmental improvements can be expected.

\(^{37}\) Irreversibility is a relative term, given a sufficient amount of financial and human resources almost all apparently irreversible change can be restored (apart from the extinction of species). Thus, irreversible change could be defined as “too costly or impossible to restore within one human generation given the available human and capital resources”. In that case a situation that is irreversible in the context of a developing country might not be so in the context of a developed country.
REFERENCES


AIDEnvironment (1996). Nederland en de mondiale uitputting van biodiversiteit. VROM Publicatierieeks Milieustrategie 1996/6B.


Barr C. (2000). Will HPH reform lead to sustainable forest management?: questioning the assumptions of the ‘sustainable logging’ paradigm in Indonesia. CIFOR.


References


Kessler J.J. (1999). Strategic Environmental Analysis Toolbox. AIDEnvironment and SNV (Netherlands Development Organisation), the Hague, Netherlands


References

Agricultural University Wageningen, the Netherlands. Wageningen Studies in Sociology.


McCay et al. (1999) On definitions from property rights.


Marshall Wilderness complex.
Africa. Ministry of Foreign Affairs, NEDA, the Hague, the Netherlands.
investeringen. VUGA, Den Haag.
174-176.
Environmental Science, Leiden, the Netherlands.
Washington.
Tropenbos (1997). Hierarchical framework for the formulation of sustainable forest management standards. Principles,
criteria and indicators. Tropenbos, Wageningen, The Netherlands.
Assembly, New York.
Van Kronenberg I. (2001). Co-management in de Peel. Doctoraal scriptie sociaal wetenschappelijke milieukunde. KUN,
Nijmegen, the Netherlands.
Institute, Amsterdam.
Van Rooy P.T.J.C. (1997). Interactieve planvorming gericht op effectiviteit en acceptatie. STOWA Boekenreeks 12,
Utrecht.
Van der Top G. (1998). The social dynamics of deforestation in the Sierra Madre, Philippines. Leiden University, the
Netherlands.
Assessment and Project Appraisal 18 (3): 177-182.
Wakker E., J.W. van Gelder and Telapak (2000). Funding forest destruction. The involvement of Dutch banks in the
financing of oil palm plantations in Indonesia. AIDEnvironment, Amsterdam.
References


Winsemius P. (1986). Gast in eigen huis. Beschouwingen over milieu management. Samson Tjeenk Willink, Alphen a/d Rijn, the Netherlands


SUMMARY

SEAN-ERA is the name for Strategic Environmental Analysis by using Emotions, Rationality and early Actions drivers. The method aims to create insight and stimulate the integration of environmental sustainability issues into development plans and planning processes, which should contribute to more conscious and effective management of natural resources. This may take place in a development perspective of polycentric organisational arrangements using an adaptive planning approach. They are guided by their own vision and bounded by a set of specific sustainability principles and standards based on value perceptions of the stakeholders involved. These are also elements of environmental governance.

This book aims to support planning and design processes. Firstly, by making use of the three ERA drivers. Secondly, by a framework with analytical tasks to integrate environmental sustainability issues into planning, including plans for institutional strengthening. Thirdly, by principles for a good planning process, based on generic principles for good environmental governance. These three components of the SEAN-ERA approach are indicated in the following figure.

In this book, Chapters 2 to 6 present concepts, cases, experiences, methods and tools, generating building blocks for the final Chapter 7.

In Chapter 2 socio-ecological concepts are reviewed. I demonstrate that resilience is a key concept for environmental sustainability, as the capacity to withstand external shocks and maintain long-term evolutionary adaptation to changing conditions. I then work out operational guidelines to take into account resilience and other environmental sustainability principles. Understanding how environmental resilience operates requires looking at scale levels and time horizons beyond our direct interests, where ecological processes that determine resilience operate. For sustainability purposes there is need to define first-tier values that cannot be substituted and are not subject to cost-benefit analysis. First-tier values and associated norms and standards are morally legitimate in view of the need to maintain biodiversity and optionality for future generations. To manage ecological and social systems, many of which show characteristics of complex adaptive systems, there is need to develop an adaptive management approach. Adaptive management refers to flexible regulation with attention for diversity, monitoring that leads to corrective action and experimental probing of the continually changing reality. It requires careful and limited steering, organisational learning and a high responsiveness to contextual changes and societal needs. I work out the concept of 'guided adaptive
management’, which is adaptive management within the bounds of standards to be respected and oriented at a long-term vision.

To consider environmental sustainability issues in a planning process, qualitative understanding (e.g. of patterns, driving forces, underlying value systems) is as important as quantitative measurement (e.g. of thresholds, sustainable use levels). In Chapter 2 models are introduced that may help discern long-term and large-scale patterns: the four-phased adaptive cycle (Fig. 2.3), the carrying capacity model (Fig. 2.4), nested scale levels providing resilience (Fig. 2.5), the relations between human management and biodiversity (Fig. 2.8) and the Problem-in-Context model (Fig. 2.12).

In the extensive Annex to this book I present case studies in which I was involved. This constitutes the empirical evidence for Chapter 3. The studies cover different spatial scales and time perspectives: local management practices of common property resources (in Yemen Arab Republic and the Sahel region), regional agricultural land-use dynamics focused at land-use intensification processes in resource-poor environments, the large-scale and continuous forest conversion process in Indonesia with linkages to global driving forces and actors, and the environmental impacts of macro-economic Structural Adjustment Programmes.

Based on these studies, in Chapter 3 I develop a two-pronged approach as the analytical basis of my planning framework. One prong is a situational analysis; the other prong is a macro-level context analysis. A checklist is provided to undertake a good situational analysis. To gain insight in macro-level dynamics I review four relevant theories (Von Thünen, Boserup, Homer-Dixon and Kleinpenning) and then work out seven typical land-use states, applicable to any country or region in the world (Fig. 3.3; Table 3.2). The states show a transition from pristine nature to intensive land-use and finally a landscape associated with a new longing for nature ('new biophilia'). The states have temporal and spatial linkages. For a certain locality, they show the evolution of different land-use states in time (like successive waves), but different states can co-exist at one point in time at neighbouring localities. The states are like stability domains characterised by a certain level of environmental diversity and resilience, and a certain level of human development and management efforts. Transitions between states can be considered as the crossing of resilience thresholds. Each state is also associated with a certain perception of nature by the people involved.

The combination of a situational and macro-level analysis will help gain insight to anticipate in location-specific ways on structural changes. In resource-poor environments development options often depend upon potentials beyond the local situation, while in resource-rich environments major threats often originate from supra-local levels.

Environmental institutions, environmental management and governance are subject of Chapter 4. Perfect environmental plans will not succeed if institutions fail. Therefore, I develop insight in how institutions function, how they are structured and how decision-making takes place, in general terms and in connection to environmental management. First, a new normative model of strategic environmental management is described, which is associated with environmental governance. It includes the setting of societal goals, principles and associated norms and regulations to create suitable conditions for management systems to operate. It aims to integrate environmental management into sectoral policies in a more pro-active way. I then define the functions and instruments for environmental management institutions, and the possible organisational arrangements required to implement these. Looking at how decision making works in reality, the need is emphasised for an adaptive perspective with room for intuition and innovation, monitoring and organisational learning, and empowerment of lower level staff and actors in the field. Management rules should enable more rapid and flexible response to ‘windows of opportunity’ at the operational level, with ex-post justification of spending based on accountability and transparency (Fig. 4.3). These are characteristics for resilient institutions.
Chapter 4 is concluded by an analytical framework (Fig. 4.4) that can be used to assess the quality of environmental management institutions, and to define strategic options and actions for improvement. The framework considers both the institutional structure and the management process, and defines criteria for both components.

In Chapter 5, I review tools and methods for analysis, assessment and planning with an environmental angle. It deals with environmental assessment methods, trends in environmental planning and design, and development models with design methods and case studies. Methods and tools include Strategic Environmental Assessment (SEA), integrated assessment, negotiation, communication and interactive decision-making tools. I make a distinction between tools and methods from the system-analytical perspective (with a focus on the planning and design substance) and those from the process-analytical and learning perspective (Fig. 5.6). For most planning models used in practice a system-analytical perspective still forms the backbone. More attention for the process-analytical tools is desirable and will also help build mutual trust, learning communities and resilient institutions. I then conclude on the desirable targets and success principles for these two planning perspectives (Table 5.6).

I then pay much attention to two models of collaborative planning that are now gaining momentum due to the dissatisfaction with the top-down (state-based) and bottom-up (community-based) planning modes (Table 5.7). One is co-management whereby the state and communities (civil society) negotiate to agree upon shared responsibilities for resource management functions. The other is integrated environmental management whereby all relevant actors in a certain region agree upon a common vision, strategy or management plan and their roles and responsibilities (without necessarily sharing these). The two modes can be used in synergy or logical sequence.

As remaining gaps to be addressed I identified the need for tools that can help set sustainability standards and norms, and acceptable procedures to enforce these standards. There is also need for methods that incorporate attention for non-utilitarian environmental values. Then there is need for methods to gain insight on linkages between global and local environmental concerns. I also noticed the tendency of making uncritical extrapolations of insights and disregarding the local context.

In Chapter 6 I review experiences with Strategic Environmental Analysis (SEAN), executed mainly by the Netherlands Development Organisation (SNV) in southern countries. It consists of a participatory process structured by 10 analytical tasks (Fig. 6.1). SEAN has been successfully implemented in several countries for analysis and strategic planning purposes mainly. Applications lead to better understanding of local environmental and development problems and opportunities and the actors involved, thus creating good conditions for stakeholder platforms, negotiation processes, mutual agreements and learning to take place. The approach has characteristics of integrated environmental management, resulting in a vision and strategy, but few concrete actions and agreements between key actors. Consistency, analytical rigour and transparency are key words characterising the process. Later in this chapter, SEAN experiences are compared with those of the Action Network (AN) program executed by World Wide Fund for Nature (WWF). Most AN programs started undertaking early actions by building upon experiences of local program leaders. The approach is more comparable to that of co-management because programs often focused on working with the key actors on the basis of concrete agreements. In many cases a break-through was achieved through negotiation with a powerful private sector or government actor. Flexibility, communication, opportunity- and action-orientedness are key aspects of the AN approach.

I conclude that, ideally, an integrated environmental management approach similar to SEAN is important to sustain a continuous process of analysis, reflection and negotiation, to generate commitment, define a long-term strategy, and ensure learning and effective collaboration. But at the same time, urgent issues and concrete opportunities should be picked up, agreements be made and co-
management arrangements established, without unnecessary delay by analysis or planning. Based on these insights, I developed characteristics for an ‘adaptive planning’ approach as compared to a more conventional ‘linear planning’ approach (Table 6.2).

In the final Chapter 7, I first introduce the ERA drivers as a new unifying concept. These are the Emotional / intuition, the Rational / system-analytical, and the early Actions driver. The ERA drivers are central to the SEAN-ERA approach. They make explicit three types of ‘logics’ and knowledge that strongly influence planning and decision making. The three ERA drivers are also important for successful organisational learning, as part of an institutional process of change.

Secondly, in Chapter 7 is presented a planning framework with analytical tasks to systematically deal with the substance of integrating environmental sustainability issues into development plans and policies. The tasks create insight in the complex relations between development and environment, including biodiversity and environmental resilience, environmental values and bottom-line standards, problems and opportunities and local-global dynamics. Included is also the design of institutional strengthening required to implement and monitor the strategy and move towards good environmental governance. The framework is partly based on experiences with the SEAN method and experiences with support to environmental management institutions.

Thirdly, I present principles and guidelines to improve the planning and design process, based on insights of effective decision-making processes and environmental governance. A good process is needed to have a ‘satisficing’ result (one which satisfies and suffices in the given circumstances), and to contribute to building mutual understanding and trust, commitment to apply the resulting strategy, networking and partnerships, as important elements to sustain a process of change. Among the principles are the need to apply a ‘guided adaptive management approach’, participation by or representation of victims of environmental change and ‘absent stakeholders’, room for the three ERA drivers, the building of coalitions to achieve real change, and the use of a self-assessment approach.

The next section of Chapter 7 has a more exploratory character. It deals with different aspects of connectedness of people, with their social surroundings, with outside nature, and with their inner nature. These three types of connectedness are fundamental to develop and nourish an inner ‘human nature’ with senses for long-term sustainability. I argue that this is required to realise a sustainability strategy.

The consideration of the applicability of the SEAN-ERA model for various purposes, in the last section of Chapter 7, leads to a range of new avenues for action-oriented research.
**SAMENVATTING**


Dit boek heeft als doel om ontwerp- en planningsprocessen te ondersteunen. Ten eerste, door gebruik te maken van de drie ERA drijfveren. Ten tweede door een raamwerk met analytische taken voor het integreren van milieuduurzaamheid in planning, inclusief institutionele versterking. Ten derde, door principes voor een goed planning proces, gebaseerd op generieke principes voor goed milieubestuur. Onderstaande figuur geeft deze drie onderdelen van de SEAN-ERA aanpak weer.

In dit boek bevatten hoofdstukken 2 t/m 6 concepten, studies, ervaringen en methoden, die bouwstenen vormen voor het laatste hoofdstuk 7.

In hoofdstuk 2 behandel ik sociaal-ecologische concepten. Ik toon aan dat veerkracht een hoofdaspect is van milieuduurzaamheid, zijnde de capaciteit om externe schokken op te vangen en om evolutionaire aanpassingen te maken aan veranderende omstandigheden. Vervolgens werk ik veerkracht en andere principes voor milieuduurzaamheid uit in een aantal operationele richtlijnen. Inzicht in milieu veerkracht vereist het kijken naar schaalniveaus en tijdsspannen buiten ons directe belang, daar waar ecologische processen werkzaam zijn die veerkracht bepalen. Voor duurzaamheidsdoelen is het tevens van belang om hoofd-milieuwaarden te onderscheiden, die niet kunnen worden uitgewisseld of vervangen, en die dus ook niet onderdeel kunnen zijn van een kosten-baten analyse. Hoofdwaarden en bijbehorende normen en standaarden zijn moreel legitiem vanwege de plicht om biodiversiteit te behouden alsmede optionaliteit voor toekomstige generaties te waarborgen. Het beheren van ecologische en sociale systemen, die karakteristieken vertonen van complexe adaptieve systemen, vereist een benadering van adaptief beheer. Dit omvat flexibele regulatie met aandacht voor diversiteit, met monitoring dat bijdraagt aan corrigerende maatregelen, en een experimentele benadering van de voortdurende veranderende realiteit. Het vereist voorzichtige en
beperkte sturing, organisatorisch leren en een sterk reactievermogen op contextuele veranderingen en maatschappelijke behoeften. Ik heb daartoe het begrip ‘gestuurd adaptief beheer’ uitgewerkt, hetgeen inhoudt adaptief beheer gericht op een lange termijn visie en afgebakend door milieustandaarden.

Om milieuduurzaamheid in een planningproces mee te wegen, zijn zowel kwalitatieve inzichten (bijvoorbeeld in patronen, krachten, waardesystemen) als kwantitatieve gegevens (bijvoorbeeld drempelwaarden, duurzaam gebruik niveaus) van belang. In hoofdstuk 2 introduceer ik diverse modellen die gebruikt kunnen worden voor het in beeld brengen van lange-termijn en grootschalige patronen: de vier fasen van de adaptieve cyclus (Fig. 2.3), het draagkracht model (Fig. 2.4), vervlochten schaalniveaus voor veerkracht (Fig. 2.5), de relaties tussen menselijk beheer en biodiversiteit (Fig. 2.8) en het Probleem-in-Context model (Fig. 2.12).

In een uitgebreide Annex van dit boek presenteer ik studies waarbij ik betrokken was. Deze vormen het empirisch materiaal voor met name hoofdstuk 3. De studies betreffen verschillende schaalniveaus en tijdspecterijen: lokale beheersmaatregelen voor gemeenschappelijk beheerde hulpbronnen (in Jemen en de Sahel regio), regionale landgebruiks-dynamiek gericht op landbouw intensivering in gebieden met weinig economische mogelijkheden, het grootschalige en continue proces van onttossing in Indonesië met verband naar mondiale krachten en actoren, en de milieugevolgen van macro-economische structurele ondersteuning programma’s.

Gebaseerd op deze studies heb ik in hoofdstuk 3 een tweedelige benadering ontwikkeld, als analytische basis voor mijn planning raamwerk. Een deel betreft de lokale situatie analyse; het andere deel betreft een context analyse op macro-niveau. Ik presenteer een checklist om een goede lokale situatie analyse uit te voeren. Om vervolgens inzicht te krijgen in de dynamiek op macro-niveau behandel ik vier relevante theorieën (Von Thünen, Boserup, Homer-Dixon en Kleinpenning). Op basis hiervan kom ik tot zeven typische landgebruik-toestanden die algemeen toepasbaar zijn (Fig. 3.3; Tabel 3.2). Deze toestanden betreffen een transitie van oorspronkelijke natuur naar intensief landgebruik en tenslotte een landschap dat geassocieerd kan worden met een hernieuwd verlangen naar de natuur (‘new biophilia’). Deze toestanden zijn met elkaar verbonden in ruimte en tijd. Voor een zekere locatie vertonen deze een evolutie in de tijd (als opvolgende golven), maar verschillende toestanden kunnen ook naast elkaar voorkomen. Deze toestanden zijn als het ware stabiliteitsvelden die gekarakteriseerd worden door een zeker niveau van milieu diversiteit en veerkracht, alsmede een zeker niveau van menselijke ontwikkeling en beheersinspanningen. De transities tussen de toestanden kunnen worden beschouwd als het passeren van drempels. Iedere toestand kan worden geassocieerd met een zekere natuurperceptie door de belanghebbenden.

De combinatie van een situatie en macro-niveau analyse geeft inzicht en maakt het mogelijk op locatie-specifieke wijze op structurele veranderingen te anticiperen. In gebieden met weinig economische mogelijkheden hangen ontwikkelingsmogelijkheden vaak af van potenties buiten het gebied zelf, terwijl in gebieden met veel hulpbronnen de bedreigingen vaak van buiten het gebied komen.

Milieu instituties, milieubeheer en -bestuur worden in hoofdstuk 4 behandeld. Perfecte milieuplannen zullen weinig succes hebben als instituties niet goed functioneren. Daarom ontwikkeld ik inzichten in hoe instituties functioneren, hoe ze gestructureerd zijn en hoe besluitvorming in de realiteit plaats vindt, en dit in zowel algemene termen als in verband met milieubeheer. Allereerste wordt een nieuw normatief model van strategisch milieubeheer beschreven, dat sterk geassocieerd is met milieubesluit. Hier valt onder het vaststellen van maatschappelijke doelen, principes, normen en regels als condities waaronder effectief milieubeheer kan plaats vinden. Het beoogt ook het actief integreren van milieubeheer in sectoraal beleid. Vervolgens werk ik de functies en instrumenten voor milieubeheer instituties uit, en mogelijke organisatorische werkwijzen. Op basis van hoe besluitvorming in de realiteit plaats vindt, wordt de nadruk gelegd op een adaptief perspectief met
ruimte voor intuïtie en innovatie, monitoring en organisatorisch leren, en sterke betrokkenheid van staf en andere actoren van de werkplek. Beheersvormen dienen ruimte te geven voor snel en flexibel reageren op ‘openingen van kansen’ op operatieaal niveau, waarbij achteraf verantwoording van uitgaven gebaseerd op transparantie mogelijk moet zijn (Fig. 4.3). Dit zijn kenmerken van veerkrachtige instituties.

Hoofdstuk 4 wordt afgesloten met een analytisch raamwerk (Fig. 4.4) dat kan worden gebruikt voor het beoordelen van de kwaliteit van milieubeheer instituties, en om vervolgens strategische opties te formuleren voor verbeteringen. Het raamwerk richt zich zowel op institutionele structuren als het beheersproces, en levert criteria voor beide componenten.

In hoofdstuk 5 behandel ik methoden en technieken voor analyse, beoordeling en planning vanuit een milieu invalshoek. Het gaat over milieubeoordelingsmethoden, ontwikkelingen in milieuplanning en ontwerp, en ontwikkelingsmodellen met ontwerp methodes. Methoden die behandeld worden zijn ondermeer strategische milieueffectrapportage, geïntegreerde beoordeling, methoden voor onderhandeling, communicatie en interactieve besluitvorming. Ik maak vervolgens een onderscheid tussen methoden vallend binnen een systeem-analytisch perspectief (vooral gericht op de ontwerp en planning inhoud) en methoden vallend binnen een proces-analytisch en leer perspectief (Fig. 5.6).

Voor de meeste planningsmodellen zijn in de praktijk methoden van het eerste perspectief overheersend. Meer aandacht voor de proces-analytische methoden is wenselijk en kan bijdragen aan het opbouwen van wederzijds vertrouwen, leren binnen groepen en veerkrachtige instituties. Tenslotte formuleer ik wenselijke doelen en succesfactoren voor beide planningsperspectieven (Tabel 5.6).

Ik geef vervolgens veel aandacht aan twee modellen van collaboratieve planning die momenteel veel aandacht krijgen, als gevolg van de onvrede met zowel ‘top-down’ (overheidsgedreven) als ‘bottom-up’ (lokaalgedreven) planning (Tabel 5.7). Het ene model is dat van ‘co-management’ waarbij de staat en gebruikersgroepen onderhandelen en afspraken maken over gedeelde verantwoordelijkheden voor milieubeheerfuncties. Het andere model is dat van ‘geïntegreerd milieubeheer’ waarbij alle relevante actoren in een bepaald gebied samen komen en overeenstemming bereiken over een visie, strategie en beheersplan, met taken en verantwoordelijkheden (zonder dat die noodzakelijkerwijs gedeeld worden). Deze twee modellen kunnen elkaar versterken en aanvullen.

Als ontbrekende aspecten van planning en ontwerp methodes noem ik methoden die kunnen bijdragen aan het stellen van milieu- en duurzaamheidsstandaarden en normen, en acceptabele procedures om deze te controleren. Er is ook behoefte aan methoden voor het nadrukkelijk aandacht geven aan niet-utilitaire milieumaatstaven. Tenslotte is er behoefte aan methoden voor het krijgen van inzicht in koppelingen tussen mondiale en lokale milieuvraagstukken. Ik merk ook op dat er neiging bestaat tot onkritisch extrapolaties van inzichten waarbij de lokale context wordt veronachtzaamd.

In hoofdstuk 6 behandel ik de ervaringen met de Strategische Milieu Analyse (SEAN) methode, met name toegepast in samenwerking met de Nederlandse Ontwikkelingsorganisatie (SNV) in zuidelijke landen. Deze methode bestaat uit een participatief proces dat is gestructureerd door 10 analytische taken (Fig. 6.1). SEAN is met succes toegepast in verschillende landen, voor analyse en strategische planningsdoeleinden. Toepassingen leiden tot beter inzicht in lokale milieu- en ontwikkelingsproblemen en kansen en de betrokken actoren, en dit levert goede condities voor samenwerking van belanghebbenden, onderhandelingsprocessen, gezamenlijke afspraken en leren. De benadering lijkt veel op die van ‘geïntegreerd milieubeheer’ resulterend in een visie en strategie, maar met weinig concrete acties en overeenkomsten tussen actoren. Consistentie, analytische structuur en transparantie zijn kenmerken van de SEAN benadering. Vervolgens vergelijk ik in dit hoofdstuk SEAN ervaringen met die van het Action Network (AN) programma uitgevoerd door het World Wide Fund for Nature (WWF). De meeste AN programma’s begonnen met vroegeacties op basis van bestaande ervaringen van locale programma leiders. Deze benadering is meer vergelijkbaar met die
van ‘co-management’ omdat de programma’s zich vaak richtten op het samenwerken met belangrijke actoren op basis van concrete afspraken. In veel gevallen werden doorbraken bereikt door onderhandeling met machtige actoren uit de private sector of de overheid. Flexibiliteit, communicatie, kans- en actie-gerichtheid zijn kenmerken van de AN benadering.

Ik concludeer in hoofdstuk 6 dat, idealiter, een geïntegreerde milieubeheer aanpak zoals die van SEAN van belang is als een continu proces van analyse, reflectie en onderhandeling, om betrokkenheid te genereren, een strategie te definiëren, leren en effectieve samenwerking te stimuleren. Maar tegelijkertijd is het van belang om urgente zaken en concrete kansen snel op te pakken, en ‘co-management’ afspraken te maken, zonder onnodig uitstel door analyse of planning. Op basis van deze inzichten kom ik tot een aantal karakteristieken voor ‘adaptief plannen’, in vergelijking met een meer conventionele bendering van ‘lineair plannen’ (Tabel 6.2).

In het laatste hoofdstuk 7 introduceer ik allereerst de ERA drijfveren als een nieuw samenvattend concept. Dit zijn de Emotionele / intuïtie, de Rationele / systeem-analytische, en de vroege Acties drijfveren. De drie ERA drijfveren zijn een centraal onderdeel van de SEAN-ERA aanpak. Ze maken in feite expliciet drie soorten ‘logica’ en kennis die een sterke invloed hebben op planning en besluitvorming. De drie ERA drijfveren zijn ook van belang voor organisatorisch leren, als onderdeel van een institutioneel veranderingsproces.

Ten tweede wordt in hoofdstuk 7 een raamwerk gepresenteerd met analytische taken voor het systematisch integreren van milieuduurzaamheidsaspecten in ontwikkelingsplannen en beleid. Deze taken creëren inzicht in de complexe relaties tussen ontwikkeling en milieu, inclusief die van biodiversiteit en milieuveerkracht, milieuyaarden en standaarden, problemen en kansen, en de dynamiek tussen lokaal en mondiaal. Onderdeel hiervan is ook het ontwerp van institutionele versterking die nodig is voor het uitvoeren en monitoren van de strategie en het ontwikkelen van goed milieubeheer. Het raamwerk is gedeeltelijk gebaseerd op ervaringen met de SEAN methode en met het ondersteunen van milieubeheer instituties.

Ten derde presenteer ik principes en richtlijnen voor het planningsproces, gebaseerd op inzichten in effectieve besluitvorming en goed milieubeheer. Een goed proces dient te leiden tot een resultaat dat in de gegeven omstandigheden bevredigend en voldoende is, dat bijdraagt aan het opbouwen van wederzijds begrip en vertrouwen, bereidheid om de resulterende strategie uit te voeren, netwerken en samenwerking, dit allen als onderdelen voor het voortzetten van een veranderingsproces. Onder de principes vindt men het toegepast van een benadering van ‘gestuurdt adaptief beheer’, participatie of vertegenwoordiging van de slachtoffers van milieuveranderingen en ‘afwezige belanghebbenden’, ruimte voor de drie ERA drijfveren, het bouwen van coalities voor verandering, en het gebruik maken van zelfevaluatie.

Het volgende onderdeel van hoofdstuk 7 heeft een meer exploratief karakter. Het behandelt verschillende aspecten van verbondenheid tussen mensen, met de sociale omgeving, met de natuur buiten en met de innerlijke natuur. Deze drie vormen van verbondenheid zijn fundamenteel voor het ontwikkelen en voeden van een innerlijke ‘menselijke natuur’ met gevoel voor duurzaamheid. Ik argumenteer dat dit noodzakelijk is voor het realiseren van een duurzaamheidsstrategie.

Een afweging van de toepasbaarheid van het SEAN-ERA model voor verschillende doelen, aan het einde van hoofdstuk 7, leidt tot een aantal nieuwe oriëntaties voor actie-gericht onderzoek.
ABOUT THE AUTHOR

Jan Joost Kessler was born on 19 April 1958 in Wageningen, and spent part of his childhood in southern countries. He studied biology at Leiden University and the Wageningen Agricultural University, and graduated in 1983 with specialisation in animal ecology and management of natural resources.

His first employment (1984 to 1987) was as a bilateral associate expert for the Ministry of Foreign Affairs, in the field of rangeland ecology in the Range and Livestock Improvement project in Yemen Arab Republic. After this he was employed from 1988 to 1990 by the Wageningen Agricultural University as a researcher in the field of agroforestry, at the Ministry of Environment in Burkina Faso. Apart from agroforestry, he was involved in rural development, sustainable agriculture and community-based forestry projects. After working abroad he was employed on a temporary basis as a researcher at the Wageningen University. He worked on a book on agroforestry in semi-arid regions and supervised various agroforestry studies in Western Africa.

From 1995 onwards, he continued work as a consultant within the non-profit foundation AIDEnvironment, doing short-term assignments. These assignments were on environmental issues of development projects and programmes, mainly in southern countries. This took place through assignments in the project cycle, on subjects of sustainable land-use, natural resource management, sustainable agriculture, agroforestry and soil conservation. In addition, he was involved in the elaboration of environmental profiles for the DGIS. He developed wide experience in application of these themes, through research and short term consultancies as an agro-ecologist and as team leader.

Based on these experiences he developed together with the Netherlands Development Organisation (SNV) an analysis and planning method called Strategic Environmental Analysis which has been applied in collaboration with SNV mainly. Apart from that, he developed a method on environmental monitoring and a framework for institutional analysis of environmental management and governance. He still works with AIDEnvironment and is involved in training these methodologies to various organisations in a range of countries and settings, workshop facilitation and supervision of applications at national, district and local levels. His work now also includes assignments on environmental policies, integrated assessment and interactive planning processes.
Abstract

SEAN-ERA is the name for Strategic Environmental Analysis by using Emotions, Rationality and early Actions drivers. Chapters 2 to 6 present reviews of socio-ecological concepts, a new approach towards land-use dynamics with states and transitions, an analytical framework for environmental institutions and environmental governance, case studies on sustainable land-use, a review of planning and design methods including collaborative management modes, and experiences with the Strategic Environmental Analysis (SEAN) method in various southern countries. These chapters provide building blocks for the SEAN-ERA model, which I developed to support planners and decision makers gain insight in environmental sustainability issues and integrate these effectively into development plans. The ERA drivers (emotions, rationality and early actions) are central to this model. They make explicit three types of knowledge that strongly influence decision making, and are important for organisational learning and institutional change. Secondly, the approach consists of a framework with analytical tasks to systematically deal with environmental issues in a development perspective. It includes attention for biodiversity and environmental resilience, values and bottom-line standards, problems and opportunities and local-global dynamics. Particular attention is given to the institutional requirements to implement the strategy and move towards good environmental governance. Thirdly, the approach includes principles and guidelines for the planning process, based on insights of effective decision making and environmental governance.

Résumé

SEAN-ERA est le nom pour l’Analyse Stratégique de l’Environnement, en utilisant les forces des Emotions, Rationalité et Actions précoces. Dans ce livre, les chapitres 2 à 6 présentent des revues des concepts socio écologiques, une nouvelle approche sur la dynamique des systèmes d’utilisation des terres avec des états et transitions, une analyse des institutions environnementales et de la gouvernance environnementale, des études de cas sur le développement durable, un résumé des méthodes et outils de planification avec des modes de gestion collaborative, et les expériences avec la méthode Stratégique de l’Environnement dans plusieurs pays. Ce sont toutes des pierres de construction pour le modèle SEAN-ERA, ce qui vise à appuyer les planificateurs et décideurs à acquérir une connaissance sur la durabilité environnementale et à l’intégrer effectivement dans les plans de développement. Les forces ERA (émotions, rationalité et actions précoces) ont une place centrale dans ce modèle. Elles constituent trois types de connaissance qui influencent largement le processus de planification et prise de décision, et sont importantes pour un processus d’apprentissage en de changement institutionnel. Deuxièmement, le modèle inclue un schéma avec des tâches analytiques pour découvrir d’une façon systématique les aspects environnementaux à prendre en compte dans une perspective de développement. Cela inclue une attention au biodiversité et au résilience, les valeurs environnementaux et standards, problèmes et opportunités et la dynamique locale globale. Une attention particulière est accordée aux aspects institutionnels requiers pour exécuter la stratégie et pour développer le gouvernance environnemental. Troisièmement, il y a des principes et guides pour le processus de planification, basés sur la connaissance des processus de prise de décision et la gouvernance environnementale.
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