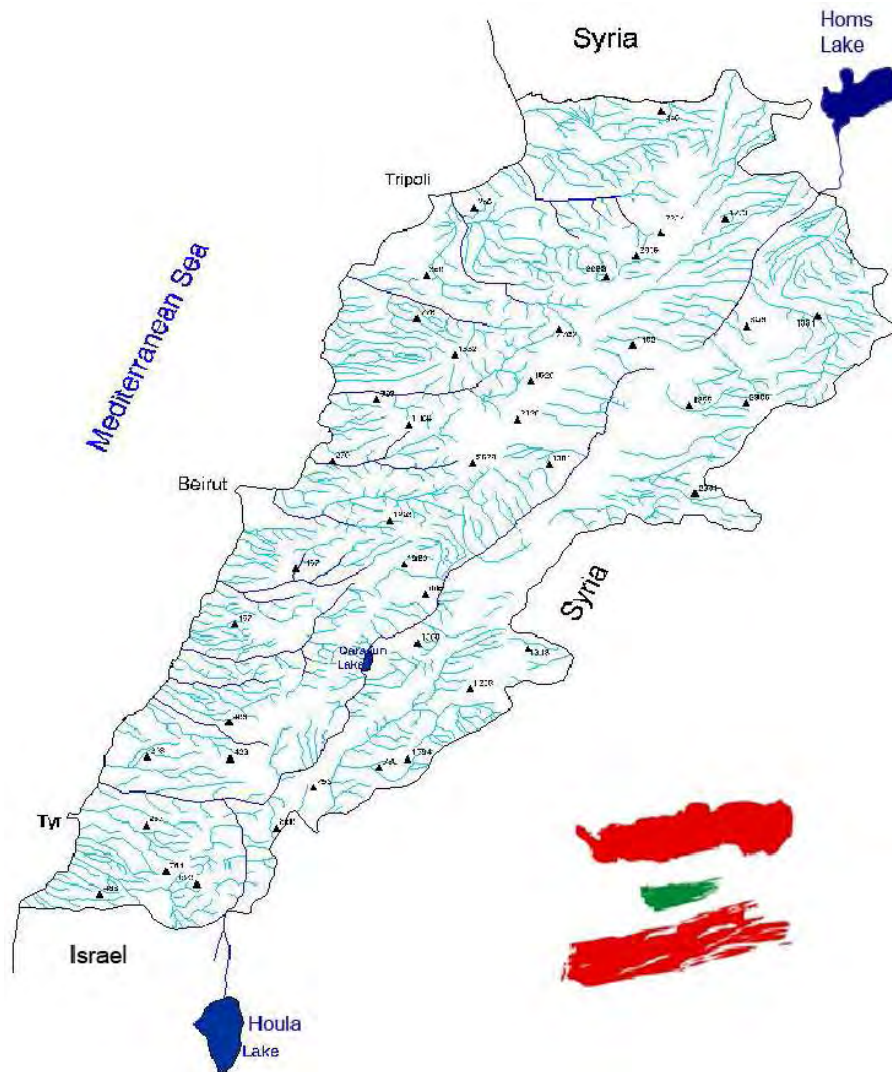


# Lebanese Waterways

## *Strengthening IWRM through WUAs in Irrigation Schemes*



M.Sc. Thesis by Georges Gharios

April 2009

Irrigation and Water Engineering Group



WAGENINGEN UNIVERSITY  
WAGENINGEN UR



# **Lebanese Waterways**

Strengthening IWRM through WUAs in Irrigation Schemes

Master thesis Irrigation and Water Engineering submitted in partial fulfillment of the degree of Master of Science in International Land and Water Management at Wageningen University, the Netherlands

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**April 2009**

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**To my Parents,  
To Cynthia and Makram,  
*With my love***



" إذا كانت الأرزة رمزاً للبنان  
فإنّ المياه هي رمز الحياة لكلّ لبناني "

الدكتور فادي جورج قمير - ٢٠٠٥

"If the Cedar is the Symbol of Lebanon

Then Water is the Symbol of Life of every Lebanese"

Dr. Fadi Georges Comair - 2005





## Acknowledgements

My father was always relating me the legend of a gold hunter who found in Ras el Ain reservoirs (Solomon Vasques) the gold pan he lost when he was prospecting on the Euphrates in Iraq. He wanted to explain me, by showing the immensity of this aquifer, the importance of water in Lebanon. My father worked his whole life in agriculture and he definitely transmitted his passion to me. He unfortunately never got a diploma; watching me graduating as an agricultural engineer specializing in water is absolutely making him proud.

This MSc thesis was conducted in Lebanon and elaborated in Wageningen between October 2008 and April 2009 but the outcomes of the research report are also the fruit of my 23 years of living in Lebanon, my agricultural academic background, my deep understanding of the context, my extended contact with the farmers and my never-ending love to this wonderful country, Lebanon.

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Georges Gharios  
April 2009



## **Abstract**

In an increasingly thirsty region, Lebanon remains unique when it comes to what has been described as the most important natural resource of the 21st century: water. However, it is not able to exploit, develop and take advantage of its hydraulic resources due to the current water management framework. IWRM is a clear option for the Lebanese government in order to reorganize the water sector but the reforms that have been initiated since 2000 have been inefficient. The scope of this study is to analyze the impact of the implementation and functioning of WUAs in irrigation schemes on the strengthening process of IWRM in Lebanon. No one is actually effectively managing water in Lebanon but almost everyone is involved in the organization of the water sector. Understanding how historical events shaped the behavioral practices of managing water in Lebanon is crucial to analyze the performance of WUAs. Despite all kind of obstacles, initiatives came up to establish WUAs and their functioning are affecting positively their surrounding environment. However WUAs should be backed by the government who should first start by providing a legal basis for WUAs implementation.

## **Key Words:**

IWRM, WUA, Lebanon, Water Reforms, Water Management and Practices, Agricultural Water Use, Water Legislation



## Summary

Since ancient times, Lebanon was known biblically as the ‘land of the Cedar and Water’. Today, it is still considered as the ‘water tower’ of the Levant thanks to the genuine rational management of hydraulic resources by the Lebanese farmers especially since the 17<sup>th</sup> century. The rural landscape of the Lebanese mountains forming agricultural amphitheatres sculpted by man and raised by nature with water bubbling up from everywhere testify this and evoke a rightful admiration. Unfortunately, the continuous wars that wreaked havoc in the country during the last century and the political, social and economical transformations of the 20<sup>th</sup> century have resulted in a fragmented and segregated management of water resources leading to scarcity.

In 2000, the Lebanese government finally started to take ameliorative statutory measures and has launched its water sector reform by adopting a water master plan and promulgating a series of laws and decrees. Although those reforms are deficient and uncompleted, they are however crucial and fundamental for the strengthening of Integrated Water Resources Management (IWRM) implementation on the long term. Of the proposed reforms, implementation of Water Users’ Associations (WUAs) in irrigation schemes is considered by many experts as one of the most important and urgent reforms to adopt. That is why the objective of my research was to analyze the impact of the functioning of WUAs on the strengthening process of IWRM in Lebanon. In order to complete this task, a good understanding of the Lebanese agricultural water uses and practices was necessary.

Therefore, this research thesis consisted of investigating first the current and proposed water reforms, studying the water management framework, considering the different agricultural water uses and finally identifying and analyzing the functioning of existing WUAs and their impact on their environments. For this, interviews with experts, senior public servants, engineers as well as professors, lawmakers and journalists were conducted while having a very dynamic field activity. The main outcomes of the research work are summarized below.

First, the relationship between water reforms and IWRM strengthening was brought into prominence after describing the current reforms undertaken by the government. Therefore, the reforms adopted since 2000 were necessary because they reduced the Autonomous Water Offices (AWOs) and Local Committees (LCs) into four Water Establishments (WEs) and they put a master plan for managing water, however, they are insufficient on their own because more reforms related to the creation of a National Council for Water (NCW) and implementation of WUAs should be adopted to meet the requirements for strengthening IWRM.

Second, in order to be able to nationally adopt the strategy of establishing WUAs throughout the country, an understanding of the current water management practices in Lebanon is necessary. No one is actually effectively managing the water but almost everyone is involved in the organization of the water sector. Moreover, the merging of the old offices into four regional WEs was definitely a good idea because it considerably reduces the administrative paper work and financial waste and it allows for the creation of technical departments with qualified engineers. On the other hand, historical events shaped the behavioral practices of managing water in Lebanon and are reflected in the many current agricultural water uses.

Third, identifying and analyzing the functioning of the WUAs in Lebanon and their impact on water resources management and on rural and agricultural development is set out. Although the Lebanese legal, social, political and administrative settings are creating obstacles towards the good implementation of WUAs, initiatives emerged from individuals and outside partners to establish WUAs masked behind agricultural cooperatives. It is true that Lebanon is still in the embryonic phase of implementing WUAs but the closer analysis has shown positive points: agriculture is

flourishing again, water is saved, production has increased, illegalities have been controlled, and people are cultivating their lands again...

Finally, in conclusion, the process of transferring power and management to the farmers associations is a much needed reform towards the strengthening of IWRM in Lebanon. The process has started but until now its evolution is still sluggish and the impacts are very hard to be seen. But as 'many a mickle makes a muckle', if we do not start now by implementing more and more WUAs, the power transferring process and ultimately the IWRM implementation would take ages. That is why the government should immediately initiate a new phase of reforms that includes the elaboration of a clear vision, a strong policy and a reliable strategy for the water sector in Lebanon. WUAs should be largely backed by the Ministry of Energy and Water (MEW) who should first start by promulgating an updated decree proposal for WUAs implementation.

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## List of Abbreviations and Acronyms

AREC	Agricultural Research and Educational Center
AUB	American University of Beirut
AVSI	Association of Volunteers in International Service
AWO	Autonomous Water Office
CCIAZB	Chamber of Commerce, Industry and Agriculture of Zahleh and the Beqaa
CDR	Council of Development and Reconstruction
CREEN	Regional Center of Water and Environment
CS	Council of South
EMWIS	Euro-Mediterranean Water Information System
ESCWA	Economic and Social Commission for Western Asia
EUNP	European Union Neighborhood Policy
EUWI	European Union Water Initiative
FAO	Food and Agriculture Organization
GDEXP	General Directorate for Exploitation
GDHER	General Directorate for Hydraulic and Electric Resources
GTZ	German association for Technical Cooperation
GWP	Global Water Partnership
HCW	Higher Council for Water
IAM-B	Mediterranean Agricultural Institute of Bari
IMT	Irrigation Management Transfer
IRWA	Improvement of Irrigation Water Management in Lebanon
ISIIMM	Institutional and Social Innovations in Irrigation Mediterranean Management
IWRM	Integrated Water Resources Management
IWRP	Integrated Water Resources Planning
LARI	Lebanese Agricultural Research Institute
LC	Local Committee
LRA	Litani River Authority
LWC	Local Water Committee
MAR	Ministry of Administrative Reforms
MDG	Millennium Development Goals
MEDA	Euro-Mediterranean Regional Program for Local Water Management
MENA	Middle East and North Africa
MEW	Ministry of Energy and Water
MFA	Ministry of Foreign Affairs
MI	Ministry of Information
MHER	Ministry of Hydraulic and Electric Resources
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoI	Ministry of Industry
MoP	Ministry of Planning
MRQ	Main Research Question
MPH	Ministry of Public Health
MPT	Ministry of Public Transport
MPW	Ministry of Public Works
NCSR	National Council for Scientific Research
NCW	National Council of Water
NGO	Non-Governmental Organization
NIA	National Irrigation Authority

NWC	National Water Council
O&M	Operations and Maintenance
ONI	Office National de l'Irrigation
ORA	Orontes River Authority
PIM	Participatory Irrigation Management
PM	Parliament Member
PPP	Public Private Partnership
RBA	River Basin Agency
RDP	Rural Development Project
ROSS	Rehabilitation,
RWC	Regional Water Committee
SBIS	South Beqaa Irrigation Scheme
SOAS	School of Oriental and African Studies
SWUA	Syndical Water Users' Association
UL	Lebanese University
UN	United Nations
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USEK	Holy Spirit University of Kaslik
USJ	Saint-Joseph University
WASAMED	Water Saving in Mediterranean Agriculture
WE	Water Establishment
WEERC	Water Energy and Environment Research Center
WFD	Water Framework Directive
WUA	Water Users' Association
ha	hectare
km	kilometer
m <sup>3</sup>	cubic meter
m <sup>2</sup>	square meter
MCM	Million Cubic Meters

## Chapter 1: Introduction

### 1.1. Lebanese Waterways

Although rain is usually greeted with great jubilation in most Middle Eastern countries, one would not expect to experience precipitation in Lebanon in that way: ‘daily downpours, often sudden and furious, a brilliant blue sky in a matter of moments that can suddenly be clouded over and deluging the mere mortals going about their daily lives below’. This is how Daryl Champion underwent his first winter season in Beirut (Daily Star, 2004).

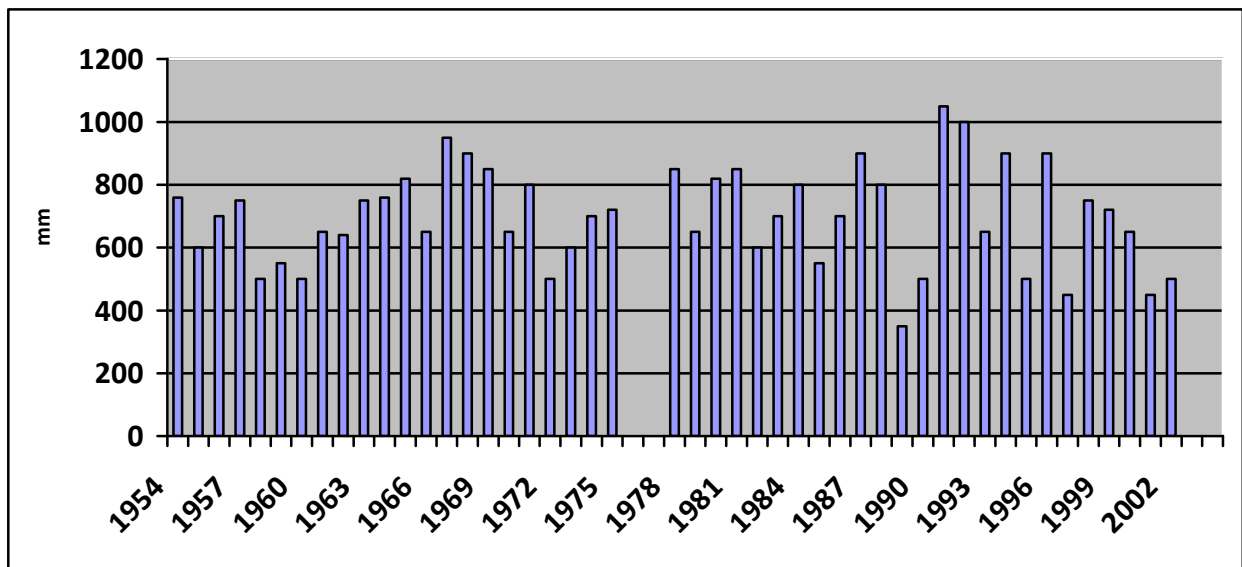
It may be now clear to readers that Lebanon is relatively blessed by Middle Eastern standards as far as water resources are concerned as figure 1 shows. But, how does a water-rich country suffer from chronic water supply shortages?



**Figure 1: Satellite image of Lebanon showing snow cover**

Lebanon is a small Levantine country covering 10,452 km<sup>2</sup> and is bordered by Syria, Israel and the Mediterranean Sea. Beirut is the capital and more than 4 million inhabitants live in Lebanon. Most of Lebanon's area is mountainous terrain (73%) except for the narrow coastline and the Beqaa Valley, which plays an integral role in Lebanon's agriculture. It has a moderate Mediterranean climate; in coastal areas, winters are generally cool and rainy whilst summers are hot and humid. In more elevated areas, temperatures usually drop below freezing during the winter with frequent, sometimes heavy snow; summers are warm and dry (Bonechi et al., 2004). By virtue of its location and topography that creates an orographic effect (Amery, 2000); Lebanon receives an annual

precipitation average estimated to be about 800mm (Comair, 2008) as shown in figure 2. However, certain areas in north-eastern Lebanon receive little due to the high peaks of the western mountain front blocking much of the rain clouds that originate over the Mediterranean Sea. Water areas cover 170 km<sup>2</sup> (1,6%) distributed between 2000 rivers (of 2<sup>nd</sup> or 3<sup>rd</sup> level order according to Mienzer classification (1923) with unitary average flow of 10 to 15 l/s providing 1,15 billion cubic meter of water (Comair, 2008)), 730 km of river length and 25 river basins (Hamamy, 2007). Hence, within the MENA region only Lebanon and Turkey have net surpluses and are the region's natural exporters of water (US Army Corps of Engineers, 1993).



F

figure 2: Lebanon Annual Rainfall (in mm) – LARI weather station (Tal Amara)

Most rivers in Lebanon have their origins in springs and are fast moving, straight, and generally cascade down narrow mountain canyons to the sea. The Beqaa Valley is watered by two rivers that rise in the watershed near Baalbek: the Orontes flowing north and the Litani flowing south. Unfortunately, there is not any navigable body of water despite the fact that 1.6% of the Lebanese territory consists of water. By titling my research report 'Lebanese Waterways' I try to revive the glory of the Phoenician civilization that was an enterprising maritime trading culture that spread across the Mediterranean during the period 1550 BC to 300 BC using the only waterway available in Lebanon, the Sea. Today, in order to resuscitate from its ashes like the Phoenix and gain back its title of 'Switzerland of the East', **Lebanon** should find better **Ways** to manage its **Water** that are crucial for its agricultural, economical and social development.

Several studies (Fawaz, 1969; Mallat, 1982; Comair, 1998) have estimated the annual water balance in Lebanon. It was agreed that the total volume of water resulting from precipitation is in an average year about 8,600 million m<sup>3</sup>, of which 50% is evapo-transpired to the atmosphere (see table 1). Additional committed outflows include surface water flows to Syria and Israel (8%), and groundwater seepage (12%).

Although Lebanon is blessed with abundant rainfall, these resources are only partly developed and its national demand for water is currently not met. Lebanon has been plagued by 15 years of civil war and its water sector (institutions and administrations) has barely been operational. It was not until 2000 that Lebanon launched the reform of its water legislation that was largely governed until 1999 by the Ottoman Majallah Code of 1877, as well as the French Civil Code (Daily Star, 2007).

<b>Hydrological Budget of Lebanon: Annual Water Balance</b>	
<b>Description</b>	<b>Average Yearly Flows (MCM/year)</b>
Precipitation	(+) 8600
Evapo-transpiration	(-) 4300
Unexploited and lost to sea groundwater	(-) 880
Groundwater losses to lake Houla	(-) 150
Losses to Syria through Orontes River	(-) 415
Losses to Syria through El Kabir River	(-) 95
Allocation to Lebanon from the Orontes	(+) 80
Losses to Israel through the Hasbani River	(-) 160
Exploitable groundwater	(-) 400
<b>Net potentially available surface flow</b>	<b>(+) 2280</b>

**Table 1: Hydrological Budget of Lebanon (Abdallah, 2002)**

Laws number 221 and 241 published respectively in May and August 2000 and law number 337 issued in March 2002 established a new institutional policy for water management in Lebanon (Comair, 2008) setting, among others, new competences for the Ministry of Energy and Water (MEW) and for the Water Establishments (WEs). These four new WEs (Beirut-Mount Lebanon, North, South and Beqaa) are entities operating under the MEW and responsible of hydraulic projects, financial investments, projects design, operation & maintenance and tariff collection in their respective areas (Comair, 2008). Moreover, in 1999, MEW published a ten years master plan (2000-2010) defining the strategy of the sector. This will increase water supply by building 32 lakes and dams in all suitable Lebanese regions and will encourage Public Private Partnerships (PPP) in order to increase the productivity and the profitability of the sector.

Those reforms aimed at improving water resources management through the implementation of Integrated Water Resources Management (IWRM). The decennial water master plan of the MEW implemented the technical approach of the IWRM concept in the country (Comair, 2008); however, on the operational level there is still a lot to be done. The new public water establishments are responsible for large hydraulic projects in their respective area, their design, operation and maintenance. Nonetheless, small and medium projects are marginalized because of the absence of Water Users' Associations (WUAs) in rural areas to manage water and irrigation schemes at the local level.

In this research, I will analyze the effects and the influence of the implementation and establishment of WUAs in rural areas of Lebanon on the development and expansion of IWRM practices. In particular, I will focus on the operational level by looking at and analyzing the water reforms conducted by the government since 2000 and by reviewing IWRM and the different ways of applying principally the operational part of it in Lebanon.



## 1.2. The Context of the Research

Codified and customary Sharia-based law of an Islamic state are considered to be the basis from which emerged the Lebanese water laws (CAMP, 2003) since the Ottomans relied on these laws to develop the Ottoman law that governed the Lebanese water legislation until 1999. During their reign over Lebanon (1515-1918), the Ottomans first codified the Muslim law and then during a second period of reforms (1845-1876) the civil law was codified again in what became known as the Majallah Code in 1877 (CAMP, 2003). The Majallah Code which was framed on the basis of the Napoleon Code by Ottoman legislators headed by Ahmet Cevdet Pasha remained prevalent until 1932; it defined water resources as public non sellable good, and divided rivers into public and private domains. It also defined water ownership and usage issues, rehabilitation of water canals, and definition of wells, springs, and rivers protection zones (CAMP, 2003).

During the French mandate, the Ottoman law was modified again and the first two water related laws copied from the French civil code were promulgated: Law 144 in 1925 that declared water resources as public property and Law 320 in 1926 that organized water rights for individual water owners (Comair, 2006). In 1930, the government of Lebanon issued a decree considering that water in private lands is privately owned, changing what was stipulated in the previous laws (Comair, 2006). Since 1951, a number of laws (in 1964, 1968, 1969, 1973, etc (Mallat, 1982)) was issued aiming at reforming the water sector, water exploitation and investment, and preserving the quality and quantity of these resources by taking ownership of water resources from individuals.

**Water reforms mean to me the amendment and improvement of what is defective, vicious, corrupt, or depraved in water institutions and organizations. They are public policies and programs that aim to change in a qualitative manner, existing water policies, institutions, organizations and governance arrangements (Wester, 2008).** Water reforms are always associated with institutional change and are the result of opportunities, pressures, demands and needs. They stem from either external changes in the environment or the acquisition of learning and skills and their incorporation in the mental constructs of the legislators (North, 1994). Until recently, water sector reform focused largely on irrigation (Merrey, et al., 2007). During the past decade the IWRM paradigm has come to dominate water reform discussions (GWP, 2000).

Since the early seventies, governments in Lebanon have wanted to restructure the water sector's administration and institutions (Kunigk, 1999). However, the incidences of the civil war stopped any projects and during the nineties, water policy reform once again became an issue on the government's agenda when a new reform project from the World Bank was launched in 1994. The Irrigation Rehabilitation and Modernization Project comprised two major components: rehabilitation and modernization of surface irrigation infrastructure covering about 27,000 ha; and provision of support to national public institutions and to regional and local institutions (World Bank, 1994). This is the first time that attention was given to the involvement of local communities in the operation and maintenance practices of irrigation schemes.

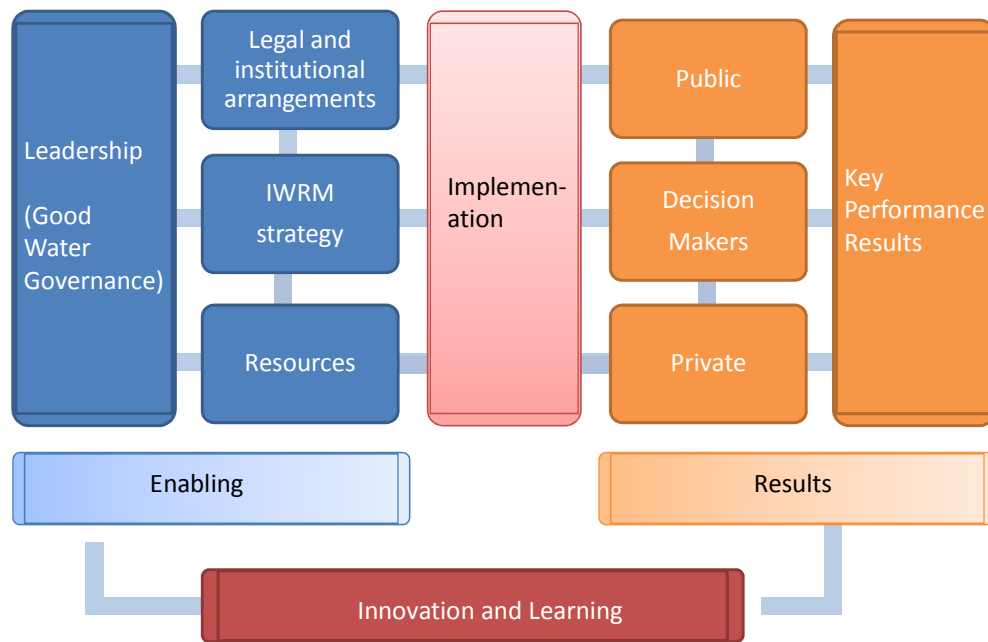
In 2000, Lebanon launched its water sector reform thanks to the expertise of several donors like the World Bank and Agence Française de Développement (AFD)(Hamamy, 2007). The first step was the prorogation of laws number 221/2000, 241/2000 and 377/2001 that regrouped the 22 Autonomous Water Offices (AWOs) and 210 Irrigation Local Committees (LCs) into four regional public Water Establishments (WEs) having their financial and managerial independence under the tutelage of the MEW. Another law (247/2000) transformed the former Ministry of Hydraulic and Electric Resources (MHER) into the Ministry of Energy and Water (MEW) and called the regional Establishments 'Water and Wastewater Establishments'. These four Establishments are situated in Beirut and Mount Lebanon, Beqaa, North and South and are in charge of hydraulic projects, irrigation, investments and their feasibility studies related to the master plan prepared by MEW. Those Establishments execute, operate, maintain and recover costs, and elaborate their tariffs and business plan, which is updated on a yearly basis (Hamamy, 2007).



Moreover, in 1999, MEW published a ten years master plan (2000-2010) defining the strategy for the sector (Hamamy, 2007). It develops water and the distribution equipment of potable water and of water for irrigation in order to satisfy Lebanon water future needs, which will reach 2.6 billion cubic meters in 2010. This plan will increase water supply by building 32 dams and reservoirs in all suitable Lebanese regions and will encourage public private partnerships in order to increase the productivity and the profitability of the sector (Hamamy, 2007). The decennial water master plan of the MEW implemented the technical approach of the IWRM concept in the country (Comair, 2008), focusing on the engineering works and designing dams and reservoirs.

Water resources in Lebanon are subjected to severe pressures acting on both the quantity aspect in terms of overexploitation and wasteful use and on the quality of resources with polluting practices proliferating in all sectors (Comair, 2006). Moreover, sectarian approaches to water resources management have dominated and are still prevailing in Lebanon; this leads to the fragmented and uncoordinated development and management of the resources (ESCWA, 2005). The different challenges of the water sector, including an overall management strategy, need an alternative that looks at the entire water cycle and integrates the environmental, social and economical patterns: hence, starting in 2000, IWRM is a clear option for the Lebanese government in order to implement the reform in the water sector (Comair, 2006) and this notion should be pushed as early as possible since this issue cannot be dealt with in isolation (Farajallah, 2005).

IWRM is a concept that has been widely adopted by developed and developing countries in order to move on from the water governance crisis caused by the sector-by-sector, top-down management style approaches that dominated in the past. It has been on the global agenda for a long time and has attracted significant attention since the international conferences on water and environmental issues in Dublin and Rio de Janeiro held in 1992 (Jønch-Clausen and Fugl, 2001). The Global Water Partnership (GWP) was established in 1996 and became the main social carrier of the notion (Mollinga, 2006). **IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP, 2000)** (see figure 3). It is thus a participatory planning and implementation process, based on sound science, that brings stakeholders together to determine how to meet society's long-term needs for water and coastal resources by establishing multi-disciplinary teams at various levels (local, regional, national and international) to communicate different perspectives on water resources, building consensus on the conservation of water resources and the maintenance of ecosystem functioning (Al Radif, 1999). Establishment of improved and integrated policy, regulatory, and institutional frameworks is also primordial for the implementation of IWRM. Therefore, and because of the existing institutional and legislative frameworks, water reforms are required at all stages in the water planning and management cycle to implement IWRM (CAPNET, 2008).



**Figure 3: The Process Model for IWRM (WUR, 2008)**

Several projects were designed by international organizations to support the implementation and development of IWRM in Lebanon along with the efforts undertaken by the MEW. EMWIS, a Euro-Mediterranean system of shared and approved information on know-how in the water sector, initiated in 2003 a four years project on improvement of irrigation water management in Lebanon (EMWIS, 2006). This encouraging endorsement towards the application of IWRM in Lebanon by the Lebanese government and international organizations is due to the promising results recorded by this concept in developed as well as developing countries. Countries like the USA, the Netherlands, Korea or Australia have recently undertaken water reform and institutional development by adopting IWRM: in Australia, reforms under their national water initiative lead to a “nationally compatible market-based system for the management of surface and groundwater” (NoWNET, 2006). Many Arab countries such as Egypt, Jordan, Morocco, Tunisia and Yemen have adopted water policies, strategies and programs that incorporate most elements and requirements of IWRM planning (WKF, 2006). Moreover, in Armenia, Integrated Water Resources Management was an innovative approach to tackle water management issues since several water reforms initiated since 1999 enabled the creation of comprehensive legal and institutional framework for integrated water resources management in the country (WRMA, 2006).

The Philippines which are in a similar case as Lebanon translated also the Integrated Water Resources Management (IWRM) approach to water resources management into an explicit national policy (The Medium-Term Philippine Development Plan (MTPDP) for 2004-2010) (Penaranda, 2007) to adopt a more integrated and holistic management of water resources and be a fundamental step towards achieving the Millennium Development Goal (MDG) target.

As I already mentioned, reforms of water sectors are required at all stages in the water planning and management cycle to implement IWRM (CAPNET, 2008). Reforms are triggered by both internal and external pressures and opportunities such as water scarcity, poverty and food insecurity (Merrey et al., 2007). While the old approach of social engineering came to be disappointing, new reforms call for attempts to transfer responsibilities to farmers’ organizations through the Irrigation Management Transfer (IMT) and Participatory Irrigation Management (PIM) approach.

**The term ‘irrigation management transfer’ means the relocation of responsibility and authority for irrigation management from government agencies to non-governmental organizations, such as water users’ associations (Vermillion and Sagardoy, 1999).** It may include transfer of decision-making authority, transfer of ownership of scheme infrastructure, transfer of water rights from government to water users’ associations or turning over to water users’ partial management responsibilities, such as water delivery, canal maintenance and paying for irrigation services, while final approval of O&M (Operations and Maintenance) plans and budgets are subject to government approval (Vermillion and Sagardoy, 1999). **PIM however is a relative concept and is defined as the involvement of irrigation users in all aspects and all levels of irrigation management (World Bank, 1996).** It consists more of a behavioral or attitudinal change than a reform process per se and seeks to strengthen the relationship between water users and government by adding farmer participation to government management (FAO, 2007). Participatory methods including transferring management of irrigation systems from government agencies to water users’ associations or other private entities have been increasingly used in the five continents. This type of reform began to be implemented as far back as the 1960s in Taiwan, Bangladesh and the United States of America. Governments often adopt IMT programs in order to improve the financial and physical sustainability of irrigation systems (as in Mexico and Chile), to improve water management and agricultural productivity (as in Andhra Pradesh in India), and to cope with constraints on government budgets (as in the Philippines and most other places) (Papin, 2003). In Macedonia, encouraging examples of IMT can be found in a form of self-organized water user groups, formed by farmers dissatisfied with the local irrigation agencies (Kärkkäinen, 2005) and in Nepal, farmer managed irrigation systems have traditions of centuries and account for almost 70% of the irrigated agriculture in Nepal (Pradhan, 2005). Irrigation management transfer and social capital in Water Users’ Associations thus can offer a way to build Integrated Water Resources Management.

In Lebanon however, the strengthening of IWRM has several weaknesses that need to be addressed to mitigate the impact of water scarcity that will face the country in the coming decades (Comair, 2006). Of the institutional and administrative issues affecting the irrigation sector, there is lack of participation by the stakeholders in project design, implementation or O&M, and the absence of Water Users’ Associations (WUA) in irrigation systems (Comair, 2006). Nevertheless, it is agreed upon that the O&M of the small and medium irrigation schemes projects should be gradually transferred to WUAs with the condition of providing a legal framework governing them.

**Water Users’ Associations or WUAs are non-profit organizations for irrigation management initiated and managed by groups of water users along one or more hydrological sub-systems regardless of the type of farms involved (IWMI, 2003).** Those organizations can be irrigation associations, water users’ cooperative societies or water management committees and the water users can be farmers, cultivators of lands, and individual members of lease-holding farms or owners of home garden plots. WUAs can have or not legal status, can be large or small, can be federated or independent, can be self-financing or dependant on government subsidies and can have democratically elected management committees or governed by other means (Mollinga and Narain, 2001).

As should be apparent, WUAs are fundamentally a participatory, bottom-up concept. Though WUAs have existed for centuries, they have received particular attention in recent decades as a development tool. WUAs have been widely accepted as the most suitable tool of transfer of management of water resources from governmental bodies to local communities. Membership in a WUA enables members to play an active role in the democratic management and distribution of water within an irrigation system. The formation of a WUA also enables farmers to collectively resolve common water and agricultural problems. WUAs have been viewed as important conflict resolution tools in Tanzania because it has been able to take over all Water Rights now held by government departments and redistribute them to regular WUAs (Sokile, et al., 2003). WUAs have

been also successfully organized in developing countries as diverse and distant as Thailand, Brazil, Turkey and Nepal among others.

### 1.3. Problem Definition and Main Research Question

In an increasingly thirsty region, Lebanon remains unique when it comes to what has been described as the most important natural resource of the 21st century: water (Daily Star, 2007). Unlike most of its neighbors, Lebanon is blessed with an average annual rainfall of 8.6 billion cubic meters (Comair, 2008). It constitutes a 'water fortress' in this region and water has been compared to petroleum by Mallat (1982), who used this provocative title to prove that water is the fuel of Lebanon and that it was necessary to work on establishing a solid juridical dossier to defend it (Mallat, 2008a). Water in Lebanon has even a higher value than petroleum because everyone can profit from it and not only the government<sup>1</sup>. However, Lebanon is not able to exploit, develop and take advantage of its hydraulic resources because water resources in use in Lebanon is only 1.5 billion cubic meters (Comair, 2008). Although its current water set-up can provide 2.2 billion cubic meters of water each year 'under economically acceptable conditions', it has also the possibility to store up to 800 more MCM (Million Cubic Meters) of water per year (Jaber [in] Daily star, 2007) and reach a level varying between 2.6 and 3 billion cubic meters of water per year.

In order for Lebanon to overcome the constraints related to the proper exploitation and management of water resources, new institutional settings and reforms should be carried out to ensure that the water sector reform process in Lebanon is undertaken in a coherent and integrated way for the successful implementation of the IWRM concept (Comair, 2006).

**Water Users' Associations (WUAs) constitute part of the general water reforms needed to assure sustainable water for the country. It is unknown whether their implementation is contributing to the development of IWRM practices at the operational level in rural areas of Lebanon.**

In the scientific problem of this thesis, it is assumed that application of water reforms do contribute to the development of IWRM practices in Lebanon; consequently, I am investigating what effect the empowerment of WUAs has on the strengthening of IWRM.

The research question is a specification and re-statement of the problem definition in the form of a question; therefore the following is my main research question:

**“What are the current Water Management practices in Lebanon and are Water Users' Associations (WUAs) contributing to strengthening Integrated Water Resources Management (IWRM) in irrigation schemes?”**

### 1.4. Objectives of the Research

This research deals with the restructuring of the Lebanese water institutions and management of water resources after twenty five years of absence of any serious improvement plans due notably to the civil war of 1975-1990. In 2000, Lebanon launched its water sector reform aiming at reorganizing its modes of governing especially by adopting the concept of Integrated Water Resources Management (IWRM). Although the decennial water strategic plan of the Lebanese government (2000-2010), promulgated as a law program by the General Directorate of the Ministry of Energy and Water (MEW), implemented the technical approach of the IWRM concept in the country (Comair, 2008), the operational approach of this concept seems far to be realized.

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<sup>1</sup> Antoine Gharios, personal communication

In order to contain the problem and try to understand the weaknesses of the system, I am conducting this research **to contribute to developing IWRM practices on the communal level in rural areas of Lebanon, by comparing the different water reforms undertaken by the government currently and analyze the functioning of WUAs and the impact of their implementation on IWRM in Lebanon.**

This research should help the government and the responsible ministries to look at an external analysis of the current water reforms and should provide them with information of the point of view of professionals and experts in this field.

- **Societal objectives:**

This research aims to develop the communal approach of governing water resources. Therefore, the societal objective of this research is **to develop farmers' potentials and capacities for managing water resources independently.**

- **Scientific objectives:**

The scientific objective of this research is **to improve the implementation and development of IWRM in rural areas of Lebanon.**

- **Personal objectives:**

This research will help me a lot in gaining experience in water reform topics and understand the multiple facets of the complex Lebanese water structure. I am really interested to work on this subject because it concerns my own country and if I can bring any modest contribution to solve the problem I would be satisfied.

## **1.5. Relevance of the Research**

From 4 to 8 February 2009, the 2<sup>nd</sup> 'Beirut Water Week' was held at the initiative of the Lebanese Ministry of Energy and Water and the Global Water Partnership - Mediterranean (GWP-Med), with the support of the Mediterranean Component of the EU Water Initiative (MED EUWI), the French Government, the MEDA Water Program and other donors. This conference was important both in its contents and its location, first because it addressed key IWRM questions in the region, particularly in the context of developing the new Strategy on Water in the Mediterranean, promoting the democratization process, strengthening institutional capacities, improving governance and enhancing the peace process in the South-East Basin (EMWIS, 2009). And second because it was held in Beirut indicating, despite the recent unrest and tragic conflict in the neighborhood, the firm commitment of the Mediterranean water community to work in a peaceful and constructive way for the benefit of the entire sub-region.

The country policies reforms were presented and discussed at the 2<sup>nd</sup> Beirut Water Week aiming at reviewing the ongoing Lebanese Strategic Plan for Water (2000-2009) and a new dialogue for the preparation of the Lebanese National IWRM Plan was launched (L'Orient le Jour, 2009b) .

The interest of the international and supranational community in Lebanon is not new and is definitely not the fruit of hazard. Indeed, Lebanon is considered by many a water rich country but because of lack of good governance it is encountering water deficit problems. Hence, Lebanon has a great potential for developing its governance capacities and applying IWRM guidelines. Undeniably, several international and local agencies, non-governmental organizations and private companies are doing a great job in the field as related to enhancing reform processes and applying IWRM regulations, **however**, less has been done by universities and academics in relation to researches and studies around the subject of water institutions and reforms.



My research work deals with the issue of water institutions reform under the concepts of IWRM, political dynamics, institutional pluralism, water control and governance... Few were the persons who tackled this crucial subject in Lebanon before me. I cannot say this was easy for me because I had a lot of difficulties concerning the literature review. Nevertheless this adds value and relevance to my research especially that a lot of experts and professionals in this field had their say in it.

All the senior officials, experts and professionals that I met throughout my three months were delighted by seeing a young man researching this issue and tackling the problem directly. Dr. Fadi Comair, the General Director of the MEW, was enchanted by my enthusiasm towards water issue in Lebanon; he greatly supported my work that he advised me to pursue a PhD program.

## **1.6. Thesis Structure**

Lebanese Waterways are about the connection between WUAs, Water Reforms and IWRM: the goal to reach is to implement IWRM, the way to do it is to adopt reforms, and one important reform is to establish WUAs. In this thesis, I tackle two main subjects denoted in the Research Question and Objectives: the current water management practices in Lebanon, and the WUAs and their impact on the strengthening process of IWRM. In order to reach those objectives and answer the question, a conceptual framework was used. It is elaborated in Chapter 2 as well as the concepts used and the methodology adopted in this thesis. The following three chapters constitute the core of my research study.

Chapter 3 analyses the water reforms undertook in Lebanon since 2000 and makes clearer the link between reforms and IWRM. In order to be able to answer the MRQ, a chapter on water reforms and IWRM was necessary. This chapter emphasizes on the role of reform in the strengthening process of IWRM and elaborate more on the action plan to implement IWRM: Establishing WUAs being an important issue to adopt.

However, before talking about WUAs and their impact, a chapter dealing with the current water management uses and practices in Lebanon was necessary to understand the agricultural water uses and traditions and value any implementation of WUAs in the Lebanese water setting. Chapter 4, which refers to the first part of the MRQ, deals with the legislative texts governing water management practices in Lebanon and explains the different agricultural water uses.

Chapter 5 refers to the second part of the MRQ. It deals with WUAs in Lebanon and their implication on the general water setting. It provides first information on the legal basis for WUA and then analyses several examples of WUAs in Lebanon. The impact of establishing WUAs is also tackled in this chapter.

Chapter 6 is the last section of this thesis. It refers directly to the MRQ since it provides answers to it. Also, it presents a general reflection on the content and concepts and gives conclusions, recommendations and opportunities for the future.

## Chapter 2: Conceptual Framework and Research Methodology

### 2.1. Introduction

Every single research is executed from a certain conceptual standpoint because each problem to be investigated has its roots in a number of theories that have been developed from different perspectives. The conceptual framework is the basis of the research problem and is used in research to outline possible courses of action or to present a preferred approach to a system analysis project. It is actually a statement of theoretical principles to guide logical and systematic development of a research design, a specific policy, or an approach to problem solving. It is sometimes called a statement of principles, and is widely used in social and behavioral sciences.

Conceptual frameworks act like maps that give coherence to empirical inquiry and they are relational tools to link concepts to each other's and to a planned or existing system of methods, behaviors, functions, relationships, and objects. Since my research study is embedded between water, water users, management and reforms, I decided to tackle my conceptual framework **by centralizing the concept of IWRM being the 'goal' to reach and to circle it by two groups of concepts beings the 'ways' to reach it** (see figure 4). The two groups of concepts represent the administrative reforms (Political dynamics and institutional pluralism) and the Agricultural water management (Governance, stakeholders' participation and water control & water management practices). They also represent the two main protagonists of the proper application of IWRM: the state and the users. This framework conceptualizes hence how the state and the water users are working through different options towards the same goal.

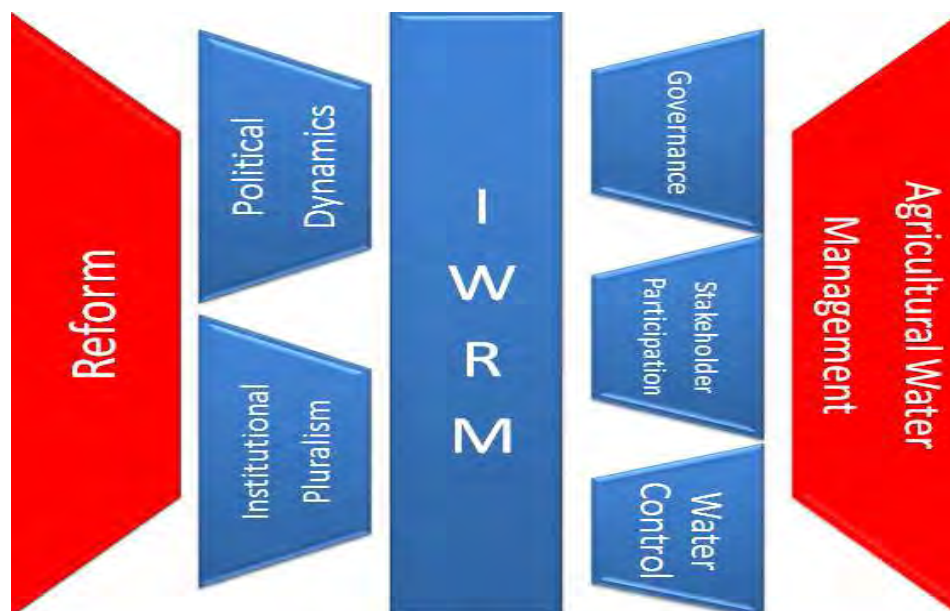


Figure 4: The Conceptual Framework

## 2.2. Concepts

### 2.2.1. Political Dynamics

Water reforms are not 'inevitable' (Wester, 2008); on the contrary, they are produced by particular constellations and have particular effects, such as the reordering modes of water control. This approach is grounded in the notion that water resources management is politically contested (Mollinga, 2001), institutional transformation is inherently political (Merrey, et al., 2007) and that policies are tools used by governments to rule and protect their assets. However, policies and institutions that may have been effective twenty years ago cannot cope with new pressures of water scarcity and food availability (Merrey, et al., 2007).

**The world is facing today many problems related to sustainable use of resources and governments are challenged by the need to provide goods and services for their citizens. All those pressures, coupled with the politicians will and their perception of applying the appropriate reforms (Comair, 2008), falls under the concept of political dynamics. Political goodwill is the key point in getting reforms adopted otherwise they will not be successful.**

Under this concept, I will be able to review and study the major sources of pressures or triggers leading to institutional change and policy reforms in Lebanon. Many governments are implementing reforms triggered by combinations of internal and external pressures (Merrey, et al., 2007) (from the environmental requirements, from the social necessities, from the economic needs as well as from the donors and development partners, from the international organizations, and from globalization of trade).

Examples from all over the world (South Africa, Chile, Brazil, Pakistan, India or Mexico) show the intense maneuvering and political momentum for institutional change and introduction of participatory approaches to water management. This intensive literature will help me understanding the political dynamics and incentives that are leading the government to initiate reform campaigns and to put into operation WUAs in irrigation schemes in order to implement IWRM.

### 2.2.2. Institutional Pluralism

The next concept I will use in my research is the institutional pluralism which can be defined as a multiplicity of rules and procedures applicable to a specific issue, as in legal pluralism (Merrey, et al., 2007). There is plurality of organizations, institutions, and laws that shape the institutional framework of the water sector in Lebanon. Rule of law, state law, customary law, law of the jungle, religious law, regional law, international law or traditional law are among the different laws that bumps into each other to impose themselves.

State law is usually strong but in heavily centralized administrative system such as Lebanon, areas that are far from the capital receives less enforcement from the central government. This can lead to confusion and conflict, but it is also an important mechanism for adaptation of water allocation to local conditions (Merrey, et al., 2007).

As governments create new water laws for implementing IWRM, there is an increasingly important issue around the incompatibility of state laws to impose uniform and relatively rigid principles and requirements, and the diversity and flexibility of local customary laws, principles and practices (Merrey, et al., 2007). Thus, I will use this concept in my research to analyze the power of the state to expand its authority on all the irrigation schemes of the country and to control the good application of IWRM practices. I will be able to understand if the plurality of laws are facilitating or



obstructing the implementation and development of WUAs under the context of IWRM and how the government is working towards the support of this issue.

### 2.2.3. Governance

Governance is a widely used term and not a new concept. Many erroneously confuse it with the term government but it is defined by the GWP as **the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society (Rogers and Hall, 2003)**. Governance is a broader notion than government and the World Bank emphasis on this to include in its definition the process by which those in authority are selected, monitored and replaced, and the effectiveness of government in implementing sound policies (Merrey, et al., 2007). In his thesis, Wester (2008) talks about domains of water governance linking them with interaction between stakeholders and institutions that engages in struggles, negotiations and at times collaboration to govern the issue-area.

In this research, the concept of governance will be used to study the struggles of power around the practices of governing water from the state as well as from water users and WUAs. The management of water is a crucial issue to examine in order to research on the possible implementation of WUAs and IWRM. The set of processes, customs, policies, laws and institutions affecting the way people direct, administer or control an organization are drawn in a specific concept of governance: corporate governance. In general terms, governance occurs in three broad ways (Ricote and Fabella, 2006):

- Through networks involving Public-Private Partnerships (PPP) or with the collaboration of WUAs,
- Through the use of market mechanisms whereby market principles of competition serve to allocate resources while operating under government regulation, and
- Through top-down methods that primarily involve governments and the state bureaucracy.

In this research, I will be able to analyse the constitution of new domains of governance that are due to policy interventions and adoption of new concepts of water management.

### 2.2.4. Stakeholders' Participation

Under this concept, two terms need to be defined: stakeholder and participation. Stakeholders are persons or groups with legitimate interests in procedural and /or substantive aspects of a given corporate activity (Donaldson and Preston, 1995). A stakeholder is also any relevant person, group or organization with an interest in the issue, either because he/she is going to be affected by the subject or because he/she has influence, knowledge and experience with the subject (Maurel, et al., 2005). According to a guideline for stakeholder identification and analysis by the Caribbean Natural Resources Institute (CANARI, 2004):

- Stakeholders are not only local people
- Stakeholders are not only organizations and formal groups
- Stakeholders are not only the users of natural resources
- Stakeholders change over time

"Participation" is one of those words that can be interpreted in many different ways because it means different things to different people (German, et al., 2006). **Essentially public participation is the process of ensuring that those who have an interest or stake in a decision are involved in making that decision (Harrison, et al, 2001)**. However, Korten (1983) defined participation as a

process of releasing people from being the subject of development and making them agents of modernization and change. Therefore, and in order to avoid confusion, it is better to refer to the type of participation (informing, implementing, taking decisions...)

The increased interest in public participation in a wide range of sectors and contexts, including environmental management, urban regeneration, agriculture... also reached the water management field. The EUWFD (European Union Water Framework Directive) stipulates that there must be active public involvement in river basin management planning (EU, 2000) and the use of participatory approaches is one of the principles of the Dublin convention (GWP, 2000). Indeed, participation of stakeholders in the overall management of water and irrigation is the main issue in PIM and IMT. Those two policies are interrelated and both refer to a transfer of managerial tasks to the farmers and groups of farmers and their active involvement along with the government.

Knowledge, information and human capacity to use it are critical to successful integrated water management and appropriate reforms. Therefore, involvement of stakeholders is crucial for the good establishments of PIM and IMT leading to the development of IWRM.

The emergence of participatory approaches demonstrates the importance of local communities consent in taking part in public decision-making processes, especially on issues that directly affect their welfare (Dungumaro, 2003). Grouping of water users and farmers under WUAs has been labeled as the cornerstone of the transfer process by the FAO (2007). WUAs are by far the most common type of organization to which management is being transferred in the world.

The concept of stakeholders' participation will be used in this research to analyze the public participation in Lebanon at different planning and management levels and understand what are the conditions for a successful IMT implementation are and how public involvement in water management issues can influence practices on the operational level of implementing IWRM. This analysis will therefore give some highlights on the willingness of the users to regroup and to participate in the management and decision-making processes as well as on the many obstacles that are present to the implementation of WUAs and IWRM.

#### **2.2.5. Water Control and Water Management Practices**

**The concept of water control refers to technical, organizational, and political aspects of water distribution activities in an irrigation system (Mollinga, 1998). Water management practices concern the overall activities of exploitation and maintenance of irrigation systems that will permit to give water to farmers for the irrigation of their crops in order to increase their productivity (El Hallani et al., 1995).**

The main advantage of this concept is that it puts the spotlights on the connection between irrigation management practices and its wider social, technical, economical and political contexts (Suhardiman, 2008). Water control refers to the activities and processes that take place in irrigation systems, who are involved, how do the actors interact, and what are the outcomes of the interactions? The water control triangle (people, water and technologies) defined by Mollinga (1997) summarizes all activities taking place in irrigation. Uphoff (1986) distinguishes in his cubic matrix three types of activities (water use activities, control structure activities and organizational activities) and Bolding et al. (2000) describe the three dimensions:

- Technical control, focusing on the regulation of physical processes through technical devices or shaping of the natural environment
- Organizational control, focusing on the regulation of human behavior
- Socio-political and economic control; this involves the conditions of possibility for particular forms of technical and organizational control

Water management practices are implemented through interplay of actors and canal structures, and thus highlight how in concrete situations the material reality and the social processes that emerge influence each other (Papin, 2003).

In this research, water control is seen under a watershed perspective implying several institutional levels, which are the national, provincial and municipal level. These have because of the reforms of 2000 some ambiguous attributions and authority. The socio-technical approach is about how the technical elements are internally related with the social ones. The social aspects are related to how social structures organize with the management of water (Acquisition, allocation, distribution, design, construction, operation, maintenance, etc).

In order to understand the processes within irrigation systems, I am using this concept in my research, where I will be able to determine how water users' practices, strategies and interactions are linked to the infrastructure and formal organization of actual system management and to analyze the functioning of irrigation schemes in relation to social requirements. I will be able to investigate how the institutional change (decentralization) shape water management by analyzing and comparing different programs and policies in order to understand what are the institutional changes that have taken place in the last years. I will be able also to analyse how the different actors organize, manage and control the socio-technical networks of irrigation infrastructure and how they manipulate the hydrological setup to establish control over the use of water resources.

### **2.3. Methodology**

This research is a correlational research looking at the influences and effects of the establishment of WUAs to the development of IWRM practices aiming at implementing general water reforms needed in Lebanon to assure sustainable water management. Therefore, this research will be based on understanding WUAs implementation and development in rural areas of Lebanon, explore their future role in the management of irrigation schemes as well as analyzing the operational approach of the IWRM concept.

An extensive literature exists on IMT, PIM and WUAs as well as on water reforms especially about Lebanon. A literature study is then a must before going to the field and collecting data. I conducted a rapid appraisal method before starting to write the proposal in order to gain a preliminary understanding of the research problem. Several talks were performed with the General Director of the MEW and a water management professor at the American University of Beirut.

The first field research method deployed was a stakeholder analysis. Afterwards, I started the data collection phase which was mainly a content analysis of documents compiled, an observation of the physical reality as well as a qualitative field research composed of interviews and questions asked to individuals and groups. Field visits to state owned irrigation projects, private irrigation projects as well as WUAs helped me to understand the realities in the field.

Dr. Fadi Comair, the General Director of the MEW and my university professor Dr. Nadim Farajallah has been really helpful and available for this research. Their great knowledge of the subject and their contact networks were crucial for me. The only complexity that happened during the field work was that my stay in Lebanon took place during fall 2008 when most of the irrigation schemes are not functioning due to the absence of water. Moreover, the work of several state offices and private organizations (represented in figure 5) was disturbed the last two weeks of December because of Christmas and New Year Holidays. This however helped me in meeting Dr. Fadi Karam and Mrs. Emmanuelle Kunigk who are living abroad but were in Lebanon on vacation during that period.

Fluency in Arabic, French and English was an advantage for me because it helped me to get in contact with foreigners experts such as Marco Perini and Emmanuelle Kunigk and allowed me to get access to documents written in the three languages. Communication in the field with farmers was therefore not a problem. My agricultural background and my Lebanese identity facilitated the field research, as I am very familiar with the country, its rural areas and its diverse cultural, political and religious influences. This, however, could well be a potential source of bias since my family is well-known in Lebanon. On the one hand, it enabled me to establish an information network rapidly. On the other hand, some of the people interviewed, especially senior officials and ministerial consultants, might have been aware of my social status. Nevertheless, I believe that these sources of bias are of minor importance to the overall objective of the conducted study.



**Figure 5: A panel of the Organizations and Institutions that I consulted and/or visited**

### **2.3.1. Research Activities**

#### **2.3.1.1. Stakeholders Analysis**

A stakeholder analysis is an important technique for stakeholder identification and analyzing their needs. It is used to identify all key (primary and secondary) stakeholders who have a vested interest in the issues with which the project is concerned (Babou, 2008) and to assess how those stakeholders are likely to be impacted by the project. The aim of stakeholder analysis process is to develop a strategic view of the human and institutional landscape, and the relationships between the different stakeholders and the issues they care about most (Babou, 2008).

A stakeholder analysis is performed when there is a need to clarify the consequences of envisaged changes or at the start of new projects and in connection with organizational changes generally.

The stakeholder analysis was conducted in this research in order to segment the institutional entities and identify the different stakeholders who might have an interest in, or be influenced by the new



water reforms in Lebanon. It helps me assess the relationship between the new policies and the actors since it was done during the first two weeks of the field work.

The analysis was guided by the guidelines for Water Resources and Development Cooperation of the European Commission (Overseas Development Administration, 1995). These guidelines include a stakeholder table, lists of projects with definitions of the status of stakeholders and a two-dimensional matrix (Kunigk, 1999).

The first step was to retrieve the organizational chart of the MEW from the Administration Department. With this chart, I have been able to understand the composition of the main responsible of water management in the country. As a result I started to identify the major stakeholders and with time the minor ones. At the end of my second week of research I was able to list the people I wanted to interview and the locations (irrigation schemes and other sources of information) I wanted to visit during the following three months of field work.

#### **2.3.1.2. Documents Compilation and Content Analysis**

Content analysis is a method of data collection in which texts are the units of observation. Researchers analyze the presence, meanings and relationships of words and concepts in the selected texts (Kumar, 2005). Qualitative content analysis is different from literature study because here it is about knowledge and data finding and analyzing.

Sometimes those data are considered as secondary data though they are very important. They include reviewing existing information on the social, institutional and political environment of water in Lebanon by looking at laws and decrees from the government as well as scientific papers written about this subject. Therefore, documents compilation consisted of several books, papers and newspaper articles and official statements that covered the subject.

The first phase of my research concentrated on finding these documents; I spent two days at the MEW archives where I have been able to get copies of three of the most important documents for my research: the 10-year Water Master Plan, the Water Code and the Laws of 2000. I also visited the three biggest newspapers (in Arabic, French and English) archives where I have been able to retrieve articles written around water issues in Lebanon during the last 10 years. I also spent a lot of times at the Library of the American University of Beirut which is considered as the largest library in the Middle East. FAO, ESCWA, UNDP and LARI libraries were also on my agenda. Last but not least, the internet is undeniably the best search engine; a rapid and reliable internet connection was secured and God know how many hours and nights I spent surfing for articles and web sites concerning water issues in Lebanon.

#### **2.3.1.3. Field Visits**

Field visits are the best way to understand the realities that are actually happening in the field. With this method I was able to see and to observe. Observation is a method of data gathering in which the researcher watches (listen, smell and sense, talk a little...) people, social situations, but also: the physical reality, etc. In qualitative research observation is usually participant observation (Kumar, 2005). An observation of the functioning of WUAs, through attended meetings and field visits to state owned water irrigation projects or private domestic water project was done in order to understand better what is happening in the field.



**Figure 6: The Canal 900 in South Beqaa where the WUA ‘Lake Share Communities Union’ operates**

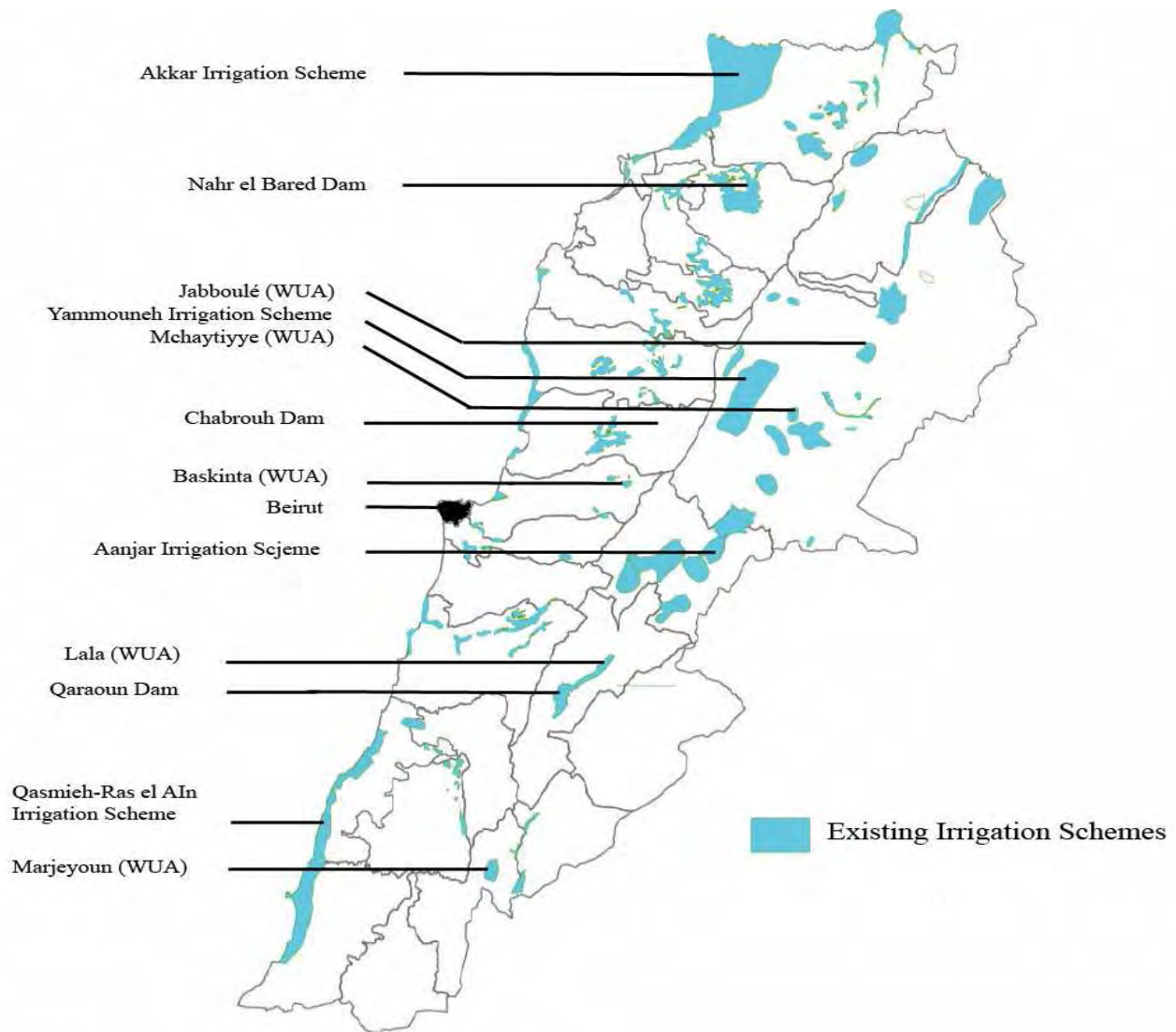
I first visited the Chabrouh Dam (built in 2007) which is the first dam that has been built in Lebanon since the Qaraoun Dam on the Litani River. The water stored in this reservoir is now primarily used for drinking water purposes waiting for the elaboration of irrigation schemes around it. My second visit was naturally to the Qaraoun Dam that was built in 1959 and that has a capacity of 220 MCM of water in its reservoir. This project also consists of a developed state owned irrigation scheme (canal 900) that covers an area of 2000 ha (see figure 6). A WUA exist on this scheme and I was able to meet its director and to understand its functioning. I was also able to visit several other state owned and private irrigation schemes where WUAs have been created for managing water and that are pretty well functioning like in the regions of Marjeyoun, Jabbouleh or Mchaytiyyeh. A list of the locations visited can be found in figure 7 and at the end in Annex 1.

#### **2.3.1.4. Interviews**

The interviews were composed of formal non-standardized (each respondent may get different questions; even the topics discussed may be different between respondents (Kumar, 2005)) and semi-structured (It permits to collect a wide range of qualitative and quantitative information while allowing respondents and interviewers the flexibility to pursue topics of interest (Beniest and Franzel, 1999)) questionnaires with mostly open-ended questions asked to key informants such as senior public servants of the MEW (minister, directors, advisers...), water management experts and engineers as well as professors, lawmakers and journalists in order to get an insider's point of view. The interviews were also conducted during informal meetings and gatherings with selected water users and group of users to get information about their opinion and role on the water reforms undergone. A list of the people interviewed, from a Parliament Member to a normal farmer, is listed at the end in Annex 2.

#### **2.3.1.5. Case Study**

A case study of the performance of a WUA in a specific region and its impact on the development of IWRM practices could have been conducted. The case study would have answered this specific question: How is the functioning of the WUA in village X contributing to the development of IWRM practices? However, the decision on conducting or not the case study was hard to take because after seeing the realities in the field I decided not to focus on a specific WUA but to almost cover all of them, all over the territory, since few are functioning.



**Figure 7: Schematic representation of the field locations I visited**

### 2.3.2. Data Collection and Storage

The equipment used in the field consisted of a map of Lebanon, a mobile phone, a car, a notebook, a personal organizer, a laptop, a camera, a USB flash drive and internet access.

All the documents retrieved from the several libraries and archives were mostly photocopied on place because as a rule, the original documents could not be taken outside. Sometimes, I received an original copy of the document when this was available. My USB flash drive also helped me a lot in collecting documents from computers or data bases of organizations or individuals.

In the field, all the relevant information, field notes and interviews were written down in a field notebook. Every day, after finishing the field work, the information written out on paper were typed, organized and stored digitally on my computer, however, no standard format was followed to store the data. A lot of pictures were taken during the field visits in order to keep them in the data base.

Moreover, a personal organizer was helping me arrange my schedule, note down my contact list, and plan my daily activities.





## Chapter 3: Water Sector Reform in Lebanon

The water sector in Lebanon has experienced many reforms throughout its history in order to adapt to the new emerging technologies or to adjust to the demographical changes and requirements. Each time, those reforms have had a considerable impact on the overall water management and on the behaviors of the farmers in their water control and use. The last reforms undertaken by the government occurred since 2000. What are the content of those reforms, have they been applied or not, and why? Are there any other ideas or proposed reforms? Those are some of the questions that this chapter is answering. The 10-year Water Master Plan and the Laws of May 2000 have been promulgated by the parliament but unfortunately only partly applied due to many financial, political and administrative obstacles. The Water Code has not either been adopted by the parliament.

Consequently, many other ideas and reforms were proposed to better adapt to the Lebanese realities in water management and to open the way for strengthening IWRM implementation. For that, a Water Strategic Paper has been written and a National Action Plan elaborated to overcome the difficulties and obstacles that are weakening the process of IWRM strengthening. One of the most important issues tackled by the Strategic Paper is the implementation of WUAs to manage medium and small scale irrigation projects.

In a nutshell, this chapter aims at explaining the relation between water reforms and IWRM. While explaining the current reforms undertaken by the government since 2000, it provides also new ideas and proposed reforms for strengthening IWRM in Lebanon.

### 3.1. Historical Background

The organization of water management in Lebanon is not new at all; rather it dates back to antiquity. Indeed, water is a common good that needs to be regulated, protected and conserved. In the Levant, water is a scarce resource and thus reveals a sacred character because it is a divine gift and we could not refuse it to someone thirsty: 'لا تمر المياه على عطشان' (Water cannot pass in front of a thirsty without using it) (Jaber, 2001). However, in irrigation water had to be regulated since 65 to 70% of water used in Lebanon goes to irrigation (Gedeon, 2007). And who says irrigation means the organization of water for rational and equitable use in order to reduce conflicts between water users and rural citizens (Jaber, 2001).

For a long time, and before the creation of the Lebanese state in 1920, the organization of water management was done by users, guided by precept, but on the basis of customs and habits that had the force of law. Indeed, before even the promulgation of law texts, citizens were progressively agreeing on a certain number of traditions related to the allocation of water resources to have an equitable use and avoid permanent conflicts (Mallat, 2003). The first reform that ever happened in the region occurred in 1839 when the Ottomans codified the civil law; this codification rested originally on the 'قوانين و أحكام' (laws & ordinances) issued by the Sultans (FAO, 1973) and on the Sharia (Muslim religious law). Before being a generic term for Muslim law, Sharia denoted the law of water 'شرعة الماء': according to the famous Arab lexicographer Ibn Mansour (1959), Sharia means the place from which one descends to water.

In the second half of the 19<sup>th</sup> century, things started to change and two important juridical events happened. The first concerns the allocation of a water distribution concession from the Dog River (Nahr el Kalb) to Beirut. This first toll given by the Ottoman Sultan under a *firman* (decree) allowed in 1870 a French engineer, Thèvenin, to pump water to Beirut and opened the way later to a series of local concessions that were created to respond to the needs of the citizens in the absence of a public administrative structure for managing the water sector (Mallat, 2003). The second event concerns a second important period of reforms (1845-1876) when the Ottoman civil law (codified in

1839) was codified again in what became known as the Majallah Code in 1877 (CAMP, 2003). This juridical situation would remain like this for the next fifty years and water users would see their status governed by customs and habits, concessions and the Majallah.

In 1931, the French high commissioner instructed a private company, the 'Hydraulic Bureau', to conduct preliminary studies for a better water management. It is not until 1937 that the Lebanese took control of their water management when the president Emile Eddé created a fully Lebanese organization, the 'Hydraulic Service'. During that time the Ottoman law underwent reforms that led to the creation of the two first water-related laws of the newly established Lebanese constitution in 1926. After independence in 1943 and until 1959, the Hydraulic Service was promoted to the rank of General Direction inside the Ministry of Public Works (MPW) under the name of General Direction of Hydraulic and Electric Affairs (Catafago and Jaber, 2001).

In 1966, the Ministry of Hydraulic and Electric Resources (MHER) was created and its services separated from MPW. In 1973, a decree-law established the two General Directions of the new ministry as well as the services and bureaus associated to it (Catafago and Jaber, 2001). Meanwhile, and since 1951, several Autonomous Water Offices (AWOs) and Local Committees (LCs) were created in all the Lebanese territory (in 1995 they were 22 AWOs & 209 LCs) to accelerate and improve services to the consumer (potable and irrigation water) in addition to break the routine (Catafago and Jaber, 2001).

Since the early 1970s, governments in Lebanon have wanted to restructure the water sector's administration and institutions (Kunigk, 1999). Indeed, in 1972 the government has anticipated the problems resulted from the multiplicity of the offices and have promulgated a decree-law merging all the AWOs into five large offices according to *mohafazats* (Governorates). This decree-law was never put into application due to the war events that started in 1975. Moreover, another decree from 1972 envisaged the creation of a Higher Council of Water (HCW) whose mission consisted of studying the politics and activities of AWOs and proposing the necessary recommendations to the minister, of ensuring the coordination and assistance between MHER and AWOs, and of studying possibilities and means to develop AWOs (Catafago and Jaber, 2001). Unfortunately, this HCW was never put in place and never functioned despite the fact that in 1983 this issue was put again on the table by a group of high public servants and experts who called for the creation of a National Council for Water (NCW) (Majdalani, 1991).

In the early 1990s, water policy reform once more became an issue on the government's agenda and a new reform project was launched with the assistance of the World Bank under the 'Coastal Pollution Control of Water Supply Projects' (Kunigk, 1999). Indeed, after the events that raged in Lebanon, it was necessary to reorganize the water sector and update laws and regulations especially that AWO were suffering from lack of staff and adequate management and that the government had difficulties in providing subsidies for the necessary investments (Catafago and Jaber, 2001). This coincided with the objectives of the World Bank and other international donors that wanted their installations and equipments to be well managed and maintained in a way to ensure their reliability and viability over time (Catafago and Jaber, 2001).

Therefore, a restructuring and reorganization of the water sector in Lebanon was necessary and that is how the laws promulgated in 2000 fits into this image. Other reforms were also undergone since 2000 and they are discussed in more details in the next section.

### **3.2. The main water reforms in Lebanon since 2000:**

In a lecture at the Syndicate of Engineers in Beirut on October 14, 1999, the General Director of Hydraulic and Electric Resources at MEW, Dr. Fadi Comair announced the projected water sector reforms by saying: 'The outline for updating, assessing and maintaining water and other resources,

is the first building block towards a better future, which is so important that it is the duty of every Lebanese to be aware of being able to contribute in pushing this country forward in the era which began with the contemporary history of Lebanon and on the basis of the oath of his Excellency the President of Lebanon to protect the homeland and the needs of the citizens’.

In 1999, the General Directorate of Hydraulic and Electric Resources proposed a 10 year plan (2000-2009) with the objective to implement and insure the necessary funds for the study and execution of works in order to satisfy the water needs of the population in several sectors (Comair, 2004). In 2000, Lebanon launched its water sector reform by prorogating several laws that were known as the laws of 2000 that merged the AWOs into four WEs and changed the MHER into MEW. In 2005, the French government initiated with the cooperation of MEW a project on supporting institutional reform of the water sector in Lebanon. Under this project, a Water Code was written.

In the following sections I develop more on those reforms that happened since 2000.

### **3.2.1. The 10-Years Water Master Plan**

‘People look at all the snow and rainfalls that Lebanon gets, and they just can’t believe that their country is suffering from shortages and high water costs’ Comair said in an interview with the Daily Star (2003) staff. He blamed current shortcomings in water supply on Lebanon’s seasonal rainfall most of which is lost to the sea and the lack of a national plan to conserve and use the resource. Comair who has a great expertise in water issues in Lebanon just put here his hand on the wound: 65 years of quinquennial and decennial plans, of conferences and seminars, of donations and loans and no effective reform for this crucial sector in the Lebanese economy. Hopefully, the 10-year water master plan (2000-2009) will not follow its predecessors to the drawers of the ministry.

On the first day of the year 1999, the Lebanese government asked from every minister to put a work plan for his ministry and prepare the studies required. In November of the same year the MEW presented its own work plan to deal with the projected water shortages that Lebanon will face. This project aims to secure the necessary funds to study, expropriate, execute and monitor the execution of works of water necessary to meet the needs of citizens now and for a period to come in the following fields (MEW, 1999):

- Securing additional exploitable water resources based upon the construction of dams and the water recharge of aquifers.
- Potable water supply projects: based upon the rehabilitation and network development, the reduction of unaccounted for water.
- Waste water projects: sewer lines, wastewater treatment plants and sea outfall.
- Projects of irrigation water: rehabilitation and new development schemes.
- Projects evaluating streams of rivers for flood mitigation and assessment of river basins.
- Processing power and electricity infrastructure.

The plan also targets efforts to improve water efficiency such as: metering, reducing the amount of illegal network connections, improving the efficiency of water use in agriculture, and developing alternative water resources such as treated wastewater (Allison, 2005). The total estimated budget for this strategy is about US\$ 1.5 billion distributed over ten years and financed by internal budgets, loans provided by financial institution and B.O.T. projects (Comair, 2006).

The 10-year water master plan is a first step towards proper, sustainable and comprehensive water management. It is composed of six chapters, five of which deal with water issues: the sixth relates to electricity infrastructure and power installations. The first chapter concerns the securing and procuring of additional exploitable water resources by controlling all subterranean reservoirs,

conserving groundwater (it takes about 12 years to refill an aquifer according to Comair (Daily Star, 2003)) and studying the possibilities of storing water in hill lakes and dams. According to Comair (Daily Star, 2003), visits have been made to hundreds of sites across the country, and studies on the geology, the watersheds and the needs of local areas were taken into account to decide on the location of the future lakes and dams. A list and a map of the locations of the dams and lakes that are supposed to be built can be found in annex 3.

The second and the third chapters of the decade plan are related to potable and waste water projects. The fourth chapter concerning the projects of irrigation water is divided into two parts: the first on existing old projects and the second on proposed projects to irrigate new lands. The first part states the modernization of irrigation schemes and the renewal of installations on existing projects to preserve the survival of these projects and blames the negative impact of drilling vast number of illegal wells near used water sources. The second part of this chapter focuses on new projects proposed to irrigate new lands especially from the water of the Orontes River and the Litani River (the two largest rivers of Lebanon).

The fifth chapter concerns projects aimed to protect lives and properties in certain section of rivers exposed to flood including residential complexes located on the shores or where damage is huge which requires the country to take responsibility for public works.

To sum up, this plan is a ten-year term and not a five-year term plan because it deals with topic of dams construction and as Comair says: 'States don't build their strategies for one or two years' (Daily Star, 2003). According to him, the best thing this plan will provide is the limitation of surface water runoff to the sea and its utilization for water projects investments (An Nahar, 2006). Building dams and lakes, he said, will open the way before other projects, including irrigation projects, and will allow farmers to reduce their production costs, making their products more competitive for export (Daily Star, 2003).

Moreover, Comair clarified that this plan will allow Lebanon to store up to 878 MCM; if each cubic meter gives a return of 20 US\$ only, then the 878 MCM will inundate the national treasury with billions of dollars (An Nahar, 2006).

### **3.2.2. Laws of 2000: Organization of the Water Sector**

The organization of the water sector in Lebanon has been regulated by several laws and decrees issued mainly in the year 2000. The idea behind this restructuring dates back to the year 1972 when the government has already understood the need of reorganizing the water sector especially by merging the AWO into five WEs and creating a HCW (see section 3.1). Although this law has been promulgated, the civil war that started three years later prevented it from being applied.

After the end of the conflict, the MHER wrote down in March 1996, in an official report between it and the Ministry of Administrative Reforms (MAR), the big lines for the restructuring of the water sector, after long consultations with the World Bank and other international donors. In 1997, a loan was negotiated with the World Bank but was removed in 1999 because the Lebanese parliament was delaying the approval (Jaber, 2001). Meanwhile the Lebanese government had already started the preparation of a new law for the organization of the water sector.

In April 2000, the Lebanese Parliament approved the new law no. 221 promulgated in May 2000 and corrected by law no. 241 in August 2000 concerning the organization of the Water sector. The law no. 247/2000 promulgated also in August concerns the renaming of the MHER into MEW. Finally, the law no. 377 promulgated in March 2002 brought amendments to the law 221/2000 that was corrected by law 241/2000. Moreover, several decrees and application decrees were issued

along to indicate some juridical issues or application procedures of those laws (decree 8122/2000...).

These laws establish a new institutional policy for water management in Lebanon. In their final version, they were structured according to the following principles (Comair, 2008):

- New competences of the MEW in view of the GDHER and GDEXPL.
- Water Establishments (WEs) replacing the 22 AWOs and the 209 LCs.
- Private Public Partnership (PPP) and the different management modes of WEs
- The Water Code
- Tariff policy Implementation
- National Dialogue launched by the European Union Water Initiative (EUWI)

The Law 221/2000 promulgated by the president of the republic in May 2000 states in its first article that the protection and conservation of natural water resources is of common national interest. The other articles deal with the following issues:

- The new competences of the MHER (the name of the ministry was changed later) that are reduced to the establishment of the national water policy and national master plan as well as the study and execution of large hydraulic projects; the other tasks being managed by the new WEs.
- The merging of the AWOs and LCs into five regional Water Establishments (WEs).
- The new competences of the WEs: Those are now responsible of the hydraulic projects inside their areas as well as their investments, studies, execution, exploitation and Operations and Maintenance (O&M).
- The functioning of these WEs, the employment, and the tariffs applied will be fixed by each WE independently.
- An auditing body will be created to control the accounts of the WE and an evaluation commission will be formed to monitor the performances.
- The continuation of the present arrangement with the AWOs and LCs for the next two years until they could be fully incorporated in the newly established WEs.
- Finally, the CEO will be at the same time the Executive General Director of the establishment to facilitate the work and any conflict between the board of directors and the executive board.

The law 241/2000 promulgated in August 2000 brings a correction to the law 221/2000. The five new WEs are reduced to four WEs plus the LRA. The new WEs are: Beirut & Mount Lebanon (Head Quarter (HQ) in Beirut), North (HQ in Tripoli), South (HQ in Sidon) and Beqaa (HQ in Zahleh). The law no. 247/2000 promulgated also in August concerns the reorganization and renaming of several ministries inside the Lebanese government including the MHER who is from now on called the Ministry of Energy and Water (MEW).

The Law number 377 published in March 2002 amended the law (221) that was corrected by the law (241) by focusing more on the waste water domain and renaming the WEs as: 'Water & Wastewater Exploitation Public Establishments'. Other amendments of minor importance have also been done in the law 377/2002.

The decree 8122/2000 indicated some juridical issues around the promulgated laws, and the application decrees governing the WEs were issued finally in October 2005.

### **3.2.3. The Water Code**

In October 2003 a cooperation program in the water sector between the Lebanese and the French government started in order to help the MEW in implementing IWRM and institutional reforms



(Comair, 2008). The project was named 'Assistance project for institutional reform of the water sector in Lebanon' and lasted 26 months. The French experts carried out many consulting missions on the water sectors, they tackled the restructuring and the institutional reorganization of the water sector and they proposed steps for the definition of the legislative and regulation code known as the 'water code' (Comair, 2008).

The 'water code' constitutes a legislative directive based on consultations and strategic orientations that aims to apply a sustainable water management concept (Comair, 2008) in order to accomplish an economic and rational utilization of the resource respecting international engagements of the Lebanese republic and the general protection principles recognized by the law (MEW, 2005).

This 'water code' (MEW, 2005) brings new definitions: the water status is defined as a national wealth including conventional and unconventional (fresh springs under the sea, atmospheric water...) water sources and wastewater treatment is considered as an element for the right of water. It also acknowledges the fundamental right for each person to have water according to his needs and his elementary requirements for life and for his dignity.

Many important points have been raised by this code including the creation of a National Water Council under the authority of the prime minister that will define the general objectives and orientations of national water policy. It also calls for the creation of hydrographic basin frameworks that will establish instruments of sustainable water management.

Another chapter in this code (title III) defines the implementation mechanism of the sustainable management and provides also the administrative application measures of the present code by means of the 'water police' (Comair, 2008). Title IV clarifies that tariffs are determined on the basis of a financial and a clear social and economical approach by applying the 'polluter pays' principle. Title V of the code determines the scope of work of the WEs, title VI establishes the preventive measures regarding the protection of water and aquatic eco-systems, title VII lists the prevention and protection against natural risks and water stress situations and title VIII presents the penal provisions applicable in case of damaging the infrastructures (Comair, 2008).

This Water Code draws the orientations and regulation framework of a balanced water management and harmonizes the partnership principles that associate the main water actors (the government, the collectivities and the consumers) (Comair, 2008). Unfortunately the Water Code has not been promulgated yet by the Lebanese parliament, although it cost US\$ 1 million to the treasury, due first to political reasons (the former Lebanese president was hostile to the French Government) and second to general unrest that prevailed in Lebanon during the last three years<sup>2</sup>. The French are apparently still waiting for an appropriate moment to hand it to the Lebanese.

The implementation of this code will confirm the concept of planning and integrated water management in addition to the Lebanese government decision to integrate the European Union Neighborhood Policy (EUNP) and mainly the implementation of the EU Water Framework Directives (EUWFD) (Comair, 2008).

### **3.3. 2000-2009: The status of the reforms after nine years**

This year 2009 should be the deadline for the ten year water master plan adopted by the government in November 1999. It is also the time to look back at what happened in the last nine years concerning the other reforms also. I will first look at the actual state of those reforms, see what has been accomplished and what not and then I will try to find what were the difficulties encountered by those reforms that prevented them from being fully applied.

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<sup>2</sup> Bassam Jaber, personal communication

### 3.3.1. Actual state of the current reforms

It could be interesting and fruitful before talking about the actual state of the current reforms to look back at the state of the reforms and water management prior to their adoption. Indeed, Mrs. Emmanuelle Kunigk experienced the water sector in Lebanon in the years 1998-1999 and researched the policy transformation and implementation at that time (Kunigk, 1999).

At that time, a lot of talking was happening around the need to plan for reforms and execute projects. The 22 AWOs were still under the tutelage of the MHER and were still working independently; a lot of discussion was still going concerning the advantages and disadvantages of merging them into five regional WEs due to political and sectarian interests. Former late minister Elie Hobeika referred to such behavior as 'Lebanon's tribal politics' (Kunigk, 1999). The Qaraoun dam built in 1959 was still the only dam built in Lebanon and no work plan was driving the MEW yet.

Now, if we look at the large picture of the Lebanese water sector, we may see that a lot of changes have been made. However if we carefully look at the details we understand that a lot more could have been done, during the same period, to utilize Lebanon's most vital resource. But the succeeded political events that happened the last ten years (the Israeli withdrawal in 2000, the assassination of the Prime Minister in 2005, the July war in 2006, the Palestinian camp bombings in 2007, the parliament inactivity, the presidential election delay, etc) hindered that process.

The ten-year water master plan was supposed, among other tasks, to build 17 dams all over the Lebanese territory. Only as much as twenty percent of those construction projects have actually been accomplished to date, according to the ministry (Daily Star, 2007). Indeed, although five of the originally proposed 17 dams are in a tendering phase now, only one has actually been completed: the Chabrouh dam for potable water supply whose capacity is only 9 MCM and barely useful for agriculture. According to Comair (Daily Star, 2007), only about US\$ 80 million has been spent so far on Decennial Plan objectives, leaving more than US\$ 900 million in yet-to-be-funded projects he described as vital for ensuring the future functioning of Lebanon's water network.

Concerning the laws organizing the water sector, although the law was published in the year 2000, the presidents and the six members of the WEs Boards were only appointed late in 2002 delaying the effective application of the law (Comair, 2006). These WEs were supposed to take over the management of the irrigation, potable water and sewerage schemes from the old AWOs and LCs. Unfortunately, not all the old offices are yet connected to the new WEs<sup>3</sup>.

Finally, the Water Code written by the French and the Lebanese governments together has not been promulgated yet by the Lebanese parliament. The French are still holding it for a later stage (see section 3.2.3).

### 3.3.2. Difficulties encountered by the current reforms

Considering the events that happened in Lebanon during the last ten years, especially the political and security instability since the assassination of the former prime minister Rafic Hariri on the 14<sup>th</sup> of February 2005, as well as the Israeli bombings of July 2006 that wreaked havoc in the country (the construction site of the Orontes River dam was targeted for instance) delaying the execution of the projects *ad kalendas Graecas*, one should not be surprised that the term for the implementation of the decennial plan of the MEW has been postponed till the year 2018 as confirmed lately by Comair (L'Orient le Jour, 2009a).

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<sup>3</sup> Georges Kadi, personal communication

Nevertheless, other direct or indirect causes have also slowed down or hindered the execution of the current projects and reforms. Hydro-geological expert Fathi Chatila blames the ten-year water master plan because it has not been based on a broader national water policy (An Nahar, 2000). Selim Catafago links up with Chatila's point of view and explains that before writing down a plan, we should have a clear **vision** of the future of the water sector of Lebanon, then a national water **policy** under which a **strategy** should be set and finally the **plan**<sup>4</sup>. In order to determine where it is going, the Lebanese water sector needs to know exactly where it stands, then determine where it wants to go and how it will get there.

Moreover, engineer Salah Saliba criticizes the absence of a water budget for the decade-plan and according to Fathi Chatila (An Nahar, 2000), the clientelism and lack of skills of the ministry's employees fritter away the millions of dollars budgeted for the decennial plan. Comair does not agree with this and states that the funds allocated to the construction of dams have been deviated to electoral purposes (L'Orient le Jour, 2007). In all cases, money is still not used for its allocated purposes.

Journalist William Long describes this decennial plan as being overly ambitious explaining its failure to launch (Daily Star, 2007). Comair accuses the government of having slowed down the approval of budgets and the execution of the projects (L'Orient le Jour, 2007) and Saliba deplores the political tensions behind the lack of convergence between the CDR and the MEW: the CDR being under the direct supervision of the Prime Minister and the MEW being controlled for the last 9 years by opponent parties. Unfortunately, it is the Lebanese citizen who is picking up the pieces and paying the hard price for the lack of water.

Furthermore, concerning the delay in the takeover of the new WEs of the management of the irrigation, potable water and sewerage schemes, the lack of application decrees could be one cause<sup>5</sup> but Comair (2006) puts the responsibility on the fragmentation and lack of cooperation or coordination of agencies in charge of water resource management, some of which are still not operational until now due to political interest and power.

It is true however that because the government forbids employment of new staffs in all the administration, the new WEs has to function with existing staff and by that are suffering from lack of adequate technical staff needed to manage water resources. They have an excess of administrative staff of 55 years of average, 'the old guard', that is usually not willing to be updated to new technologies; *Sutor, ne supra crepidam*<sup>6</sup>. Comair (2006) raises also the issue of the need to create Water Users' Associations (WUAs) in order to facilitate the implementation of the several reforms blaming the lack of participation by the stakeholders in project design, implementation, and the absence of WUAs among consumers for the rearrangement of small and medium irrigation schemes projects.

Finally, concerning the Water Code that has not yet been promulgated by the Lebanese parliament, the political instability that governed Lebanon during the last four years avoided the French from sending the document to the Lebanese authorities especially because of the presence of an opponent president at the head of the state until November 2007. They are unfortunately still holding on to it albeit the election of Michel Suleiman in May 2008. Selim Catafago here blames the 'Lebanese Manner' of doing things twice saying that a water code had already been drafted in 1998 with the help of a French expert and that it had cost nothing to the treasury<sup>7</sup>.

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<sup>4</sup> Selim Catafago, personal communication

<sup>5</sup> Maya Aoun, personal communication

<sup>6</sup> Bassam Jaber, personal communication

<sup>7</sup> Selim Catafago, personal communication



### 3.4. Other ideas and proposed reforms

It is true that the reforms undertaken by the government since 2000 were necessary and indispensable; nevertheless, new ideas and proposed reforms are always welcomed in this arena to widen the point of views. Some are inapplicable, some are utopian, but some are also outstanding and the decision makers should take more time to look at them before it is too late. Ironically, all the unapplied ideas proposed during the last 60 years are still the same being called for adoption today by water experts.

The writings of Maurice Gemayel are an example of those ideas that were never applied because there were maybe too good for Lebanon. Maurice Gemayel was a keen partisan of hydraulic planning since 1951 when he started publishing articles in the francophone newspaper *L'Orient le Jour* requiring the creation of a Ministry of Planning (MoP). Many of his ideas and recommendations were just marginalized at that time and still today. He was always saying that a water planning is the base of an economical planning meaning by planning: 'a coherent setting of a particular unit of great works at the national level' (Gemayel, 1951). The topicality of some of his writings is the proof of the futuristic vision of Maurice Gemayel. He later became the minister in charge of MoP and will elaborate an integral planning for the Lebanese waters where he refers to a technical report presented by Sir Alexander Gibb that the Lebanese authorities have never wanted to take into consideration.

Already in 1948, in his report, Sir Alexander Gibb was calling for the establishment of a closer connection between the Ministry of Agriculture (MoA) and the hydraulic service (ancestor of MEW): 'hydrology is treated in this moment as an end in itself' (Gemayel, 1951). Unfortunately this constraint resides in the fact that agriculture was and still is not a clear political priority for the Lebanese government who has always adopted the economy of the white collars<sup>8</sup> (tertiary sector, tourism, banking...). Moreover, agriculture was additionally marginalized during the Syrian tutelage over Lebanon (1990-2005) and the gap between the primary and secondary (under MEW responsibility) and the tertiary (under MoA responsibility) canals increased regrettably.

In 1972, the government have wanted to separate the tasks of the MHER between energy and water resources by creating a Higher Council of Water (HCW) whose mission would have consisted of studying the politics and activities of AWOs and proposing the necessary recommendations to the minister, of ensuring the coordination and assistance between MHER and AWOs, and of studying possibilities and means to develop AWOs (Catafago and Jaber, 2001). In 1983, a group of high public servants and experts called for the creation of a National Council for Water (NCW) (see Annex 4 for the organizational chart of the proposed NCW). The role of this council would have been to define the national water policy and to plan it at the national and regional level. It would have had the same prerogatives of the Council for Development and Reconstruction (CDR) (see section 4.2.1) but only concerning water (Majdalani, 1991). Unfortunately, none of the Higher Council of Water or the National Council for Water has ever functioned.

Today, ironically, many water professionals in Lebanon agrees that the MEW and the MoA should work together to manage the water and calls for the creation of a national authority for governing water that would be under the control of both ministries.

Indeed, in a personal communication, Adel Cortas developed more on this issue explaining that a new law should be promulgated by the Lebanese parliament calling for the creation of a National Irrigation Authority (NIA), on the example of the Office National de l'Irrigation du Maroc (see Box 1), that will contain the management of all the small and medium irrigation schemes; the management of large irrigation schemes (the Litani and at a later stage the Orontes) will have their own authority body (the LRA and eventually the Orontes River Authority (ORA)). The NIA will be

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<sup>8</sup> Hyam Mallat, personal communication

directly under the authority of the government following the statuses of the CDR and Council for South (CS). Cortas also drew the attention on the fact that this law should reserve an article concerning the creation of WUAs and their incorporation under the authority of the NIA (see section 5.1.2).

**Box 1: Morocco's Office National de l'Irrigation (Swearingen, 1988)**

Moroccan irrigation development was stalled, before the creation of the Office National de l'Irrigation (ONI) in 1960, because the responsibilities over its management were unclear between several stakeholders.

The solution was the creation of the ONI that brought under a single roof all the various bureaus involved with Morocco's irrigation development facilitating the communication and optimizing agricultural production. In addition it took over the control of the regional centers existing in the irrigation areas.

Although ONI was dismantled in 1965 before it could effectively undertake its given task, its development formula, comprising cooperatives and contracts has continued to present and is a good example of Participatory Irrigation Management (PIM).

Moreover, during an Expert Group Meeting on National Institutional Reforms for the Implementation of IWRM in the ESCWA Region that was held in Oman in March 2007, the ESCWA published a 'Guidelines for the required institutional arrangements for implementation of IWRM policies' where it proposes a new institutional structure (see Annex 5) that aims to facilitate policy integration, to ensure programme coordination and communication both horizontally and vertically and to monitor the achievement of social and economic objectives at the national and local levels for implementation of IWRM plans (ESCWA, 2007). Of the mechanisms included in this structure, we find again a National Water Council (NWC) along with Regional and Local Water Councils (RWCs and LWCs); the WUAs being under the direct authority of LWCs.

According to the ESCWA (2007), a NWC should be established at the highest political level (chaired by the Head of State or the Prime Minister) for policy integration and to strengthen cooperation and coordination among concerned stakeholders. The mandate of the proposed council is to coordinate Government policies, to follow-up the implementation of national IWRM plans and to set policy priorities for the implementation of developed strategies and programmes (ESCWA, 2007).

It is clear now that reforms are always needed not only to change the system but also to update it and adapt it to the increasing needs of the growing population. Furthermore, in the case of Lebanon, reforms are definitely needed now in order to fully apply IWRM, as we are going to see in the following section.

### **3.5. Towards IWRM implementation: The role of the reforms...**

The water sector in Lebanon has been so far managed without the existence a national policy for IWRM implementation but rather through decisions, decrees, laws and regulations that sometimes date back to the Ottomans; even though Lebanon has developed a Decennial Strategic Plan for the water sector (2000-2009) (Comair, 2006). Implementing IWRM is the goal that we should reach; carrying new institutional changes and reforms are the way to do it<sup>9</sup>.

<sup>9</sup> Fadi Comair, personal communication

Indeed, ESCWA (2007) states that new institutional settings and reforms need to be carried out for the successful implementation of the IWRM plans and Comair (2008) adds that reforms at different levels of the water sector should be initiated; the achievement of those reforms will open the way to the application of IWRM in Lebanon:

- Creation of river basin organizations
- Elaboration of reasonable economic development policies and Elaboration of a fair tariff system
- Implementation of regulations and clear institutional frameworks
- Installment of a communication system that takes into consideration the participation of all the stakeholders in the decision making process
- Working at the involvement of stakeholders in project design, implementation, or O&M, and **providing legal bases for the creation and implementation of Water Users' Associations (WUA) for the rearrangement of small and medium irrigation schemes projects**
- Updating of the 10 year strategic plan endorsed by the Lebanese Government and the Lebanese Parliament
- Preparing an IWRM National Plan and approving the 'Water Code'

### 3.5.1. IWRM in Lebanon

IWRM is currently being adopted at several degrees by many countries especially in the Mediterranean basin including Lebanon. However, the implementation of IWRM in these countries depends on the political will of the decision-makers and their disposals to apply the appropriate reforms in the water management field (Comair, 2008).

In Lebanon, the ten-year water master plan adopted in 1999 by the government implements the technical approach of IWRM in the country: dams' construction, irrigation schemes modernizations, flood mitigation, etc (Comair, 2008). Moreover, the laws organizing the water sector promulgated in 2000 constitute a first and important step in establishing a new solid institutional policy for the water management in Lebanon.

Unfortunately, the strengthening of IWRM in Lebanon faces several obstacles. These obstacles weaken the process and slow down its implementation. Institutional and administrative issues related to the functioning of the newly established WEs constitute a main complication for the successful implementation of IWRM. Delays in appointing directors and engineers, delays in issuing executive business plans, lack of skilled technical staff, political involvement.... All of this affects the strengthening of IWRM in Lebanon.

Moreover, some efforts have been made to involve the private sector in domestic water management (the potable water system of Tripoli for instance). All WEs chairmen share the same vision of eventually handing over management of potable water systems in the main cities to the private sector. Nevertheless, no efforts have been made to address the need for farmers to assume O&M functions of irrigation schemes that serve them through the establishment of WUA, to ensure their sustainability (Comair, 2006).

Nonetheless, the MEW, with the cooperation of international organizations such as EMWIS and GWP, is working at the formulation and drawing of an IWRM National Plan (L'Orient le Jour, 2009b) that will incorporate socio-cultural, economical and environmental specificities of Lebanon into the strategies and tools required for the good implementation of IWRM.

### 3.5.2. The Water Strategic Paper or how to apply IWRM in Lebanon

On the 22nd of January 2007 the Water Sector Reform Workshop was held in Beirut with the objective of preparing a Water Strategic Paper that will be sent to donor countries ahead of the Paris III Donation Meeting for Lebanon (Comair, 2008). In this strategic paper, Fadi Comair introduces the concept of integration saying that Integrated Water Resources Planning and Management (IWRP and IWRM) requires greater collective awareness, solidarity and cooperation on all sides (Ministries, Water Establishment, Municipalities, Private Sector, Regulatory Bodies, Donor Agencies).

The Water Strategic Paper explains the tools and methods for applying IWRM in Lebanon. Its application should be made with the involvement of scientific, technical, economical and financial instruments which are properly adapted for the social and cultural Lebanese environment and its management should be efficient, harmonious and balanced involving a vast number of both public and private bodies partnership (Comair, 2008).

Practical issues concerning the management of potable water, industrial water and waste water are carefully presented in this paper by Comair (2008). Moreover, and since 65 to 70% of water consumed in Lebanon is used for irrigation, the MEW and the WEs have to ensure the construction, exploitation and maintenance of water related infrastructures (reservoirs, canals, galleries and networks). Comair adds that the WEs has to manage the big irrigation projects **leaving for the Water Users' Associations (WUAs) the management of medium and small scheme projects.** The matrix of the Water Strategic Paper can be found at the end in Annex 6.

### 3.5.3. National Action Plan for IWRM strengthening in Lebanon

A National Action Plan should be conducted in order to define an overall water policy and for IWRM strengthening in Lebanon. The main topics of this action plan are related to water monitoring, data collection and assessment of water. Moreover, four domains of action are described in more details (Comair, 2008).

Technical studies should continue on dam sites, hill lakes and unconventional submarine springs (many aquifers in Lebanon are opened to the sea through submarine fresh water springs). The Water balance (demands vs. resources) should be determined more accurately and be available for decision makers. Water should be rationalized and optimized to be conserved and protected. A water development and management plan should be established in order to reach a better efficiency.

Furthermore, the master plan of water management in Lebanon should consider the following chart of actions to be implemented for IWRM strengthening. These are structured under major themes (Comair, 2008):

- Information System for the Water Sector
- Adaptation of the Institutions
- Economic Analysis
- Health and Environment
- International Basins
- Projects

Finally, as a long term strategy, an IWRM system is to be established. The broad objectives of this water management shall cover the utilization and development of water resources in an efficient, environmentally sound, equitable and reasonable manner in order to satisfy society's demand for water, water related goods and services, as well as to safeguard the ecological functions of water resources (Comair, 2008).

### 3.6. Reflection on Water Sector Reform in Lebanon

Chapter 3 brought into prominence the relationship between water reforms and IWRM. After describing the current reforms undertaken by the government, it showed the role of the reforms in implementing IWRM.

Since 2000, three main reforms were related directly to the water sector management: the 10-year Water Master Plan, the Laws of 2000 and the Water Code. Due to several financial (weak water budget and corruption), political (lack of will, war of July 2006) and administrative (delay in issuing application decrees) obstacles those reforms have not met their objectives: only one dam of the 17 stated in the 10-year water master plan have been constructed, the WEs have not taken total control over the old AWOs and LCs still, and the Water Code has not yet been promulgated by the parliament. Moreover, apart from all those problems, those reforms have not solved the issue of management of irrigation schemes. If the large scale projects are being managed by the MEW, the medium and small scale projects should be managed by the inexistent WUAs. Indeed, none of those reforms even tackled the subject of implementing WUAs.

Therefore, the reforms adopted since 2000 were necessary because they reduced the AWOs and LCs into four WEs and they put a master plan for managing water, however, they are insufficient on their own because more reforms related to the creation of a NCW and implementation of WUAs should be adopted to meet the requirements for strengthening IWRM.

A first step in this issue has already been taken with the elaboration of a Water Strategic Paper which is a more comprehensive approach to manage water in Lebanon than the water master plan because a plan cannot work if it does not fit into a strategy. Also the European and Mediterranean community that are working together with the MEW for the elaboration of an IWRM National Plan to set the water policy of Lebanon is definitely a good step forward.

J.A. Allan in a lecture at the merged Geography departments of King's College and SOAS in 2008 expected 25 years to see the effects of reform changes; since the current reforms in Lebanon are only 9 years of age, we can look ahead to see impacts of reforms on IWRM by the year 2025 hoping that the water code would be promulgated by that time.



## Chapter 4: Water Management Practices in Lebanon

In order to be able to nationally adopt the strategy of establishing WUAs throughout the country, an understanding of the current water management practices in Lebanon is necessary. Indeed, it is crucial to value the existing practices and customary traditions in order to better adapt the strategy of WUAs establishment to the Lebanese water setting. That is why this chapter will answer the first part of the MRQ.

The first section of this chapter deals with the legislative texts that govern water management practices in Lebanon. It is a detailed description of the historical background of texts and customs that ruled over Lebanon since antiquity and that shaped the agricultural water practices for hundreds of generations. Then, in a second section, a focus is made on the actors and institutions that manage water in Lebanon. As Jean Monnet said ‘nothing is possible without men; nothing is lasting without institutions’; a detailed description of the roles and tasks of the two main bodies of water management in Lebanon: the MEW and the WEs is provided. Finally, in the last section, details are given about the different agricultural water uses in vigor in Lebanon describing the overall picture of the Lebanese water setting.

### **4.1. *Water is a public good that should be protected and conserved* – Legislative texts on water management in Lebanon**

Reading about the recognition of land ownership and the distribution of water in Lebanon and the Levant during history can be very fruitful because one can understand how societies evolved positively in this region around water that constituted a determining element in the constitution of states, empires and cities. The emergence and the brilliance of the Lebanese political model since the 17th century was directly tied to the agreement of villages, families and communities to use water in a peaceful manner that could be useful to everyone. This phenomenon started especially after agrarian stabilization that pushed political and social partners to cooperate because the benefactions of water distribution were much more considerable and consistent than conflicts over water that could only degenerate into violence and destruction of properties (Mallat, 2008b). Karl Wittfogel (1957) depicted water sharing as a central principle in oriental societies saying in his famous analysis that ‘in arid or semi-arid landscapes, agrarian civilizations can persist permanently and prosperously only on the basis of hydraulic economy... and this necessitates cooperation on a large scale’.

Most communities that inhabited Lebanon during history were installed next to fresh water resources (rivers, lakes, springs...). They have developed customs and practices to manage water as a precious natural resource and to adjust it uses according to the demographic development of the rural population. Each community tried to find an appropriate solution to make balance between the needs and the resources, especially in irrigation where agriculture occupied the main activity (Gedeon, 2007).

Therefore, the principle *Water is a public good that should be protected and conserved* constitutes the basis of all the legislation that governs water sector in Lebanon and that we find in different periods of its history (Catafago and Jaber, 2001):

#### **4.1.1. Customs and Habits**

As I already mentioned, irrigation management in Lebanon was always governed by the agreement of the different partners on peaceful manners to utilize water. These manners were usually unwritten, were transmitted through generations, and have established some rules managing the



practical uses of water and particularly its exploitation in irrigation (Gedeon, 2007). The legislator recognized them as customs and habits.

Customs and habits are constituted by a certain number of rules responding to the common sense of peoples and recognized with time and with the approval of generations by the legislator (Catafago and Jaber, 2001). They have been imposed by concern of the conservation of properties and good allocation of water between users.

Nobody knows exactly the date of origin of these customs and habits but what is sure is that they are older than the 18th century since the first written text available is dated to 1733 (Catafago and Jaber, 2001).

#### **4.1.2. Ottoman Texts**

The customs and habits remained unwritten until the first Ottoman text related to water management in Lebanon was published in 1733 by Bishop Abdallah Qhorra Ali. This juridical treaty was named 'Summary of the legislation in Lebanon during the *Chehab Emirs* period' and contained several chapters on water use, drinking water rights and distribution of common canals between different properties.

However, it is not until the publication of the Majallah code in 1877 that a large part of the prevailing customs and habits was transformed into juridical texts. The Majallah code which is based on customs and habits, Sharia and Napoleonic code, confirmed that groundwater is a common property, considered water as a non-sellable good to which everyone has a right (مباح - *mubah*) and protected the different water sources (حريم - *Harim*) (Gedeon, 2007). Moreover, water ownership is acquired by gift, inheritance or occupation and two basic legal principles are recognized: (حق الشفاء – the right to drink) as everyone may quench his thirst from both public and privately owned rivers and (حق الشرب – the right to irrigate) as everyone has the right to use public water for irrigation (Nicolaidès, 1888). Some of the Majallah code texts are cited as references and are still valid today.

Agricultural water management has been regulated by the Irrigation Code published by the Ottomans in 1913. This text, manifestly incorrectly translated from the Turkish, does not follow any methodological or scientific approach and is unfortunately still in force in Lebanon because not any significant amendment has been taken to modify it (Mallat, 2003). The first eight articles in this code define the different parts of an irrigation network according to the Ottoman system. The Lebanese legislator has kept some Turkish denominations: *Qanat* (canal), *Yadock* (first canal branching), *Khork* (first *yadok* branching), *Aghzalog* (water connection), *Khandak* (ditch), *Sawjak* (diversion), *Ayak* (base) and *Oughin* (underground canalizations) (Mallat, 2003).

Article 8 of this code differentiates between public property and private property. Article 10 dictates an obligation to all the owners of downstream land to accept the discharge of the water coming from the upstream land owners which are obliged to avoid any damage on downstream lands. Particulars are also responsible of renovation and cleaning of the networks which they have established and used, under the watchful eye of the water agency (Gedeon, 2007).

Moreover, in March 1918, a law related to the repairing and the restoration of the common channels of irrigation was also published.

#### **4.1.3. Period of the French Mandate (1920-1943)**

The bylaw 144 from 1925 related to the public domain and the bylaw 320 from 1926 related to the protection and utilization of public water constitute the fundamental texts governing the water



sector in Lebanon (Mallat, 2003) and are still valid today; the basic principles established with the publication of these bylaws being unchanged until now.

The content of these two bylaws is important and put for instance dispositions to the implementation of water users associations (I will elaborate more on this issue in section 5.1). Other important texts (decrees, laws and bylaws) related to the water sector has been also published during the French mandate concerning for instance a particular regulation of irrigation water distribution in the plain of Baalbeck (decree 169/1942) or the establishment of a WUA in the Walnut River (Nahr el jaouz) (decree 65/1943).

Due to the absence of planned irrigation projects during that period, all the elaborated legislations have been general and haven't matched the purpose of developing the agricultural use of water (Gedeon, 2007).

#### **4.1.4. Post-Independence Period (1943-1975)**

After the independence of Lebanon that was proclaimed on the 22<sup>nd</sup> of November 1943, several texts related to the organization of water management and practices were elaborated; the most notable one being the decree 14438/1970 that organized the uses of underground water according to the article 6 of the decree 320/1926. Indeed, prospecting the underground water is essential for the agricultural production, especially in the regions where there is no possibility to explore any source of water and where no irrigation development plans have been implemented (Gedeon, 2007). Consequently, and despite the absence of a clear methodology, this decree has constituted the first important approach for organizing the exploitation of underground water in Lebanon and the regulation of its utilization (Gedeon, 2007).

The post-independence period assisted also to the creation of the Litani Water Authority (LRA) in 1954. The Litani project constitutes one of the major public realizations of the last 50 years and thus required the creation of a special public establishment with four important missions (Mallat, 2003):

- To execute the Litani River Project including irrigation, marsh draining, potable water, hydroelectricity, in accordance with the services of the state and the support of the American technical mission (Point Four Program).
- To establish a junction network between the electrical units in Lebanon.
- To establish transformation stations and distribution networks in Lebanon.
- To exploit the different phases of the project in technical and financial aspects.

#### **4.1.5. War Period (1975-1990)**

The war stopped any project to be executed limiting optimal exploitation of water resources; especially the second phase of the Litani Project that was already planned. Apart a text regulating control of pollution by the ministries of Health and Environment, no water-related texts were issued during this whole period.

Moreover, a lot of damage has been done on hydraulic infrastructures and a lot of illegalities occurred in underground water prospection.

#### **4.1.6. Post-War Period (since 1990)**

After 15 years of civil war, Lebanon has been forced to review many dispositions related to water use to recapture the missed period of war. The reestablishment of plans, projects and legislations, constituted a necessary step (Gedeon, 2007) that were made concrete in 1996 by the promulgation

of a series of decrees related to the restructuring of existing AWOs. Many important actions were also taken during that period starting with the significant collaboration of the World Bank that led to the modernization of the Qasmieh-Ras el Ain irrigation project in 1998, the execution of the South Beqaa irrigation scheme and of course the creation of the famous law 221/2000. The impacts of this law to the agricultural water management practices were already mentioned in details in section 3.2.2.

## **4.2. Current Water Management Framework of Lebanon**

### **4.2.1. The main actors of water management in Lebanon:**

The government authority responsible for water and sanitation in Lebanon is MEW (formerly MHER). Its several departments cover irrigation, water supply, research, development and planning activities. However, other related or independent actors and institutions are also involved in the water management sector. Their responsibilities are interrelated and therefore it is difficult to discern a clear authoritative system linking promulgated decrees to the corresponding and appropriate agencies (Comair, 2006). They are described here below.

#### **▪ The Ministry of Energy and Water (MEW)**

The MEW, formerly the Ministry of Hydraulic and Electric Resources (MHER), is the main actor of water management in Lebanon since it prepares and puts in place the general water policy and executes the projects. When this ministry was created in 1966, its objectives were mainly related to the execution and generalization of projects, application of laws and regulations and control of AWOs and concessions (to be noticed that the last concession was bought by the state in 1982). Nonetheless, the law 221/2000 presented two innovations to the MEW (Mallat, 2003):

- the recognition that ‘ the protection of the natural water resources and its development towards the conservation of the environment and ecosystems are considered of fully right public utility’ (article 1 of law 221/2000)
- the determination of the missions of the ministry in relation to the hydraulic resources correspondingly to the dispositions of the article 2 of law 221/2000 (study supply and demand, and global situation of the water resources in Lebanon; prepare the national water master plan; design, implement and operate large hydraulic facilities; conserve and control the water resources including surface and underground water; exercise administrative supervision over the WEs and the LRA) (Comair, 2006).

The MEW is constituted of two General Directions (article 2 of law 20/66 and law 247/2000): the General Directorate of Hydraulic and Electric Resources (GDHER) responsible for research, studies and implementation of large-scale projects and the General Directorate for Exploitations (GDEXP) responsible for supervising WEs, overseeing the public establishment, for administration and financial aspects and for mines and quarries (Comair, 2006).

Four services and two directorates are directly connected with the GDHER: the administrative department, the planning service, the electric equipment services, the environment services, the directorate of technical studies and the directorate of water which is responsible of studying, executing and supervising irrigation and potable water projects. The MEW organizational framework can be found in annex 7.

### ▪ **The regional Water Establishments (WEs)**

The four regional Water Establishments (Beirut and Mount Lebanon, North, South and Beqaa) have been newly created by the law 221/2000 after the merging of the 22 AWOs and the 209 LCs, although the application decrees were not issued until October 2005. The merging of the AWOs is not a new idea, rather it has already been proposed in 1972 by the government to reduce costs and have better communications.

Indeed, many AWOs were only covering a small area (AWO of Qoubayat for instance<sup>10</sup>) and thus did not have the means to create an accounting or a technical service inside their office. Now, with the merging of all those AWOs, the new WEs will profit from higher returns and will be able to provide better management.

The law 221/2000 gave the new WEs a higher flexibility to work and to manage water more efficiently. They have now the responsibility of managing irrigation, potable and waste water within their area. Only the WE of the South is not responsible of its irrigation water, the LRA will take care of it.

### ▪ **The Litani River Authority (LRA)**

The Litani River Authority was created by a law published on the 14th of August 1954 and was established with four important missions that were explained previously in section 4.1.4. In 1955, the LRA was given the technical and the financial power for operating and exploiting all Litani River Basin related projects. In 1962 this power was extended to include a water development plan for all the Litani/Awali basins and the area between the international Beirut-Damascus road and the southern Lebanese boundary (Comair, 2006).

The law 221/2000 intentionally disposed in its 7<sup>th</sup> article that the LRA will remain bound to the law of 14/8/1954 concerning the development, management and exploitation of irrigation schemes and associated works in South Beqaa and South Lebanon. That is why today the WE of the South is only responsible for potable and wastewater management and not irrigation water. The LRA also monitors and measures rivers flows throughout the country (Allison, 2005).

### ▪ **Other Ministries**

Other ministries are also involved in the water management of Lebanon. Some have direct impact on water management practices such as the Ministry of Public Health (MPH) that has the mission to watch over the protection of the consumer by controlling potable water and monitoring pollution; the Ministry of Environment (MoE) that fights against pollution (Litani watershed for instance) and misuse of natural resources like water and the Ministry of Agriculture (MoA) that deals with aspects such as monitoring of irrigation water quality, research, extension and training for optimal utilization of water in farming.

Others have indirect impact such as the Ministry of Public Transport (MPT) that manages the meteorological stations in Lebanon, the Ministry of Industry (MoI) that regulates water uses by industries (10%), the Minister of Information (MI) that plays an important role in awareness raising campaigns, the Ministry of Administrative Reforms (MAR) that participates in elaborating new texts and legislations and the Ministry of Foreign Affairs (MFA) that plays an important role in negotiations over international transboundary waters.

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<sup>10</sup> Bassam Jaber, personal communication

- **Universities and Water Research Centers**

Lebanese Agricultural Research Institute (LARI), Agricultural and Research Education Center (AREC), academic agricultural faculties (AUB, USJ, USEK and UL) and water research centers (CREEN and WEERC) intervene principally in four domains: formation, research, trials & controls and seminars & conferences (Catafago and Jaber, 2001).

- **Non-Governmental Organizations (NGOs)**

NGOs usually play the role of assistant in needy rural areas. However, after the war of July 2006, NGOs started to seek for external donors to accomplish a master relief plan in Lebanon and especially in the South.

That is why several NGOs such as AVSI (Association of Volunteers in International Service) or GTZ (German association for Technical Cooperation) were involved also in water related projects and WUAs establishments. I will talk more about the involvement of NGOs in the implementation of WUAs in Lebanon in the 5<sup>th</sup> Chapter.

- **Water Users' Associations (WUAs)**

Several WUAs have been created in the last 10 years in Lebanon and they are contributing positively to the agricultural water management in the regions they are acting. Chapter 5 will elaborate more on their roles and actions.

- **Farmers**

The farmers are considered to be the base stone of all the agricultural water management practices since they are at the bottom of the pyramid of actors involved in Lebanon. They are working their land and they are managing their water inside their properties, and they have been doing this for hundreds of years. They transformed the mountains into a huge fertile amphitheatre where water flows from everywhere (Volney, 1787), they survived in this region despite the Ottoman occupation by just farming and finally they perfectly used this precious water through practices that scientists are still today trying to understand. This is a tribute to the Lebanese farmers that I will analyze in section 5.3.1.

- **Other Actors**

Other actors involved in the water management practices in Lebanon but at a minor degree include the several United Nations (UN) agencies (FAO, UNDP, ESCWA...), the municipalities (they generally manage the wastewater network but some of them such as Deir el Qamar or Baaqline conserved their function of distributing potable water in their district (Catafago and Jaber, 2001)), the National Council for Scientific Research (NCSR) created in 1962, the Council for South (CS) created in 1970 to help the population of South Lebanon that was under Israeli occupation and the Council for Development and Reconstruction (CDR) created in 1977 after the abolition of the Ministry of Planning (MoP). The CDR has the responsibility of selecting, in cooperation with line ministries, the institution or combination institutions required for implementing projects financed by donors (Comair, 2006).

#### **4.2.2. Effective water management in Lebanon**

It may be obvious after enumerating all the actors of water management in Lebanon that water **is** somehow managed. However, we should not rely on outward appearances and on the amount of actors involved because actually **no one** is effectively managing water in its formal definition.

It should be clear that MEW and WEs are the main government authorities responsible for water but in fact they are not fully managing this water. Indeed, Water Establishments in Lebanon do not functions like River Basin Agencies (RBA) and thus they do not control their own budget, they cannot control or stop pollution over their basins, they cannot put the laws or regulations specific to their basins and they cannot control land use, ecology or socio-economic factors. The WEs are only companies delegated by the government to provide services to the consumer (irrigation, potable or waste water). For instance, if somewhere in upstream Litani, someone is polluting the river, the LRA does not have any power or means to stop him or to adopt measures against him<sup>11</sup>. The responsibility of this goes back to the MoE although this issue concerns the Litani River and the LRA directly.

The problem of the assignment of responsibilities over water management in Lebanon is closely related to the political framework of the state<sup>12</sup>. When the whole governmental body is heavily centralized, it is difficult for the ministries and especially the MEW to delegate and transfer power to regional authorities as it should be in a decentralized system. That is why WEs are still closely tied to the MEW and WUAs are facing difficulties with the administration as we will see in chapter 5.

The creation of RBA could be a solution to answer the question if anyone is actually managing the water and will definitely be the answer for the good implementation of IWRM in Lebanon as already stated in section 3.4.

### **4.2.3. The Water Establishments**

#### **4.2.3.1. The Autonomous Water Offices and the Local Committees: a heritage from the past**

The Autonomous Water Offices and the Local Committees were meant to be merged under the four new WEs according to law 221/2000 and were supposed to disappear gradually within two years of the law enactment date. However, due to technical, administrative, and financial constraints encountered by the new WEs, some of those AWOs and LCs are still functioning. That is why I am talking about them in this section.

The organization of the AWOs and their relations with the old MHER are governed by the decree 4517/1972. Their mission consists of exploiting hydraulic and electric projects executed by the MHER and this under the latter's tutelage. In the Lebanese jurisdiction, administrative tutelage differs from civil tutelage in the sense that the ministry can only approve or rejects AWOs decisions and cannot modify them whereas the tutor in civil law undertake all the actions of the person under tutelage (Catafago and Jaber, 2001). The goal of this tutelage is to protect the legality and other national public interests (Jaber, 2001).

According to Comair (2006), under MHER tutelage, 22 AWOs operated with various degrees of autonomy (a list and geographical map of those AWOs can be found in Annex 8); 209 water and/or irrigation LCs, created during the war between 1984 and 1990 to cover the absence of the government to manage water, were under the tutelage of the AWOs. Out of these 209 committees, 18% were for potable water, 60% were for irrigation, 14% for both potable water and irrigation and eight percent had no clear mandate.

The role of the AWOs was mainly charged with management of potable water (setting water fees for instance), under the supervision of the MOEW, except for three RWA (Batroun, Barouk and

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<sup>11</sup> Selim Catafago, personal communication

<sup>12</sup> Selim Catafago, personal communication

Baalbek/Hermel which also dealt with irrigation) (Comair, 2006). On the other hand, the role of the LCs was restricted to the operation, maintenance, rehabilitation and renovation of the networks and equipment.

An interesting point is to be noted: those LCs were generally created over a small river, a village spring or a local well; out of these 209 LCs, there were 25 Irrigation Committees efficiently undertaking the O&M tasks. These Committees could easily form the nucleus of the proposed implementation of IWRM based on Water Users' Associations (Comair, 2006).

#### **4.2.3.2. What is the role of the new regional Water Establishments**

The new regional Water Establishments were created by merging all the old AWOs and LCs into four WEs for better communication and administrative issues. Article 3 of the law 221/2000 concerns the creation of five 'Water Exploitation Public Establishments' more commonly and informally called WEs. They will be responsible of the following actions (Comair, 2008):

- Hydraulic projects in their respective areas
- Financial investments requirements
- Project design along with the master plan framework
- Execution of the water networks
- Operation and maintenance of all water infrastructures including wastewater collection and treatment plants
- Tariff collection for all water sectors
- Quality control of drinking and irrigation water and sludge treatment of wastewater

The law 241/2000 corrected the previous law (221) by stating that the WEs are four and not five: Beirut and Mount Lebanon (Head Quarter in Beirut; 450,000 subscribers), North (HQ in Tripoli; 90,000 subscribers), South (HQ in Sidon; 110,000 subscribers) and Beqaa (HQ in Zahleh; 65,000 subscribers). The Law 377/2002 amended also the law (221) that was corrected by the law (241) by focusing more on the waste water domain and renaming the WEs as: 'Water & Wastewater Exploitation Public Establishments'.

Although the law was published in year 2000, the presidents and the six members of the WEs Boards were only appointed late in 2002 delaying the effective application of the law. The WEs are supposed to take over the management of the irrigation, potable water and sewerage schemes, but due to the technical, administrative and financial constraints, they are physically not able to undertake these tasks bestowed upon them by the law (Comair, 2006). The management of the irrigation as well as the sewerage schemes is still in the hands of the GDHER, AWOs and LCs because many AWOs have not yet been connected with the new WEs<sup>13</sup>.

#### **4.2.3.3. The outcomes of the merging of the 22 AWOs into four regional WEs**

If we look carefully at the functioning of the AWOs since their creation and especially after the end of the war in 1990, we can understand from what those AWOs were suffering and why their merging under four new regional WEs was necessary (Catafago and Jaber, 2001):

- Concerning management practices issues, everything depends on the state of the hydraulic infrastructure. Most installations have been completed before the start of the war in 1975, and if those projects had a prescription period of 25 years, it is clear that today they cannot fulfill the increasing requirements. The leakages in the networks reach sometimes 50 %.

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<sup>13</sup> Georges Kadi, personal communication



- On the administrative and financial levels, the average staff age is 55 years and employment has been restricted by the government. Financial autonomy is discussed and only four out of the twenty-two AWOs had a certain financial equilibrium (thanks to the potable water revenues). The high number of AWOs led to a big parceling limiting the establishment of financial and technical departments in several AWOs.

That is why the government already thought in 1972 to merge those AWOs into four or five WEs (see section 3.1). In 2000 however, the law 221/2000 concretized this need after almost thirty years of struggling. The idea behind these reforms was the reduction of *a priori* (independent from experience) control on water management practices and the augmentation of *a posteriori* (based on empirical evidence) control<sup>14</sup>.

However, although the law has been voted on May 2000, it is not until October 2005 that the application decrees have been issued; and because of the latest events that happened (War of July 2006...) some AWOs or LCs have still not been connected with the new WEs. Moreover, no application decrees were issued still to open the way for the employment of qualified engineers and technical staffs<sup>15</sup>. Nevertheless, at the end all the AWOs and LCs will disappear and there management will be in the hand of the new WEs that are in control of irrigation water, potable water and wastewater<sup>16</sup>.

Furthermore, the issue of who is actually managing water in Lebanon (see section 4.2.2) resurges when Dr. Selim Catafago calls for the evolution of the WEs from production and water services providing to effectively managing water in the manner of the Basin Agencies. Besides, Dr. Adel Cortas look at the WEs in another way; he thinks that the merging of the AWOs and LCs into four regional WEs is a good and important step, however, he calls for the separation of potable water services from irrigation water management because potable water gives more revenues in faster time and this diverts the WEs to focus only on potable water services.

### 4.3. Agricultural Water Uses and Practices in Lebanon

Before tackling the issue of implementation of WUAs in irrigation schemes, it would be wise to have a clear holistic picture of the different actual agricultural water uses and practices in Lebanon.

#### 4.3.1. Acquired Rights on Water: tradition & water allocation

The general principle of hydraulic resources in Lebanon is founded on the recognition of the state being the owner of the public domain by virtue of related legislative texts and recognized legal exceptions (Mallat, 2003). The public domain has been determined by article 2 of bylaw 144/1925 where the state has been attributed the integral ownership of all hydraulic resources of the Lebanese territory (waterside, bays, streams, groundwater...) within the limits of the private ownership and the acquired rights on water as defined in article 3 of bylaw 144/1925.

In the Lebanese law, private ownership of water can be acquired through heritage, donation, and purchase or acquired rights on water before the 26<sup>th</sup> of May 1926 (Mallat, 2003). This status quo has its roots in the Majallah code who specify the acquisition of a permissible good that has no owner – in this case water.

The bylaw 320/1926 has recognized the acquired rights on water who dates back to the Ottoman period. The Ottomans used to give land parcels the right of irrigating (إنتفاع - profit) from a close

<sup>14</sup> Bassam Jaber, personal communication

<sup>15</sup> Nabil Chemaly, personal communication

<sup>16</sup> Bassam Jaber, personal communication

source of water (spring, stream or river) and the right of constraint (إرتفاق – water passage constraint) to the neighboring land parcel. While conceding to the state the exclusive ownership of water resources, the legislator thought well to outlay a certain number of customary rules of possession and utilization of water *ab antiquo* (the old remain in seniority)<sup>17</sup>. This legislative exception has been consigned in the article 3 of bylaw 144/1925: ‘persons having, on the public domain, rights of ownership, usufruct or use of water, pursuant to the old traditions or legal documents will keep these rights’. Indeed, any person that could justify rights on water acquired before the 26 of May 1926 keeps those acquired rights (Mallat, 2003).

Practically, how are those acquired rights on water reflected in the current water management practices in Lebanon? First, it should be clear that acquired rights on water only concern land parcels that were already irrigated during the Ottoman occupation (small-scale irrigation schemes) such as the western hillside of the mountains where most of the 2000 springs of Lebanon are found. Newly irrigated lands by modern irrigation projects since the French mandate are tackled in the next section.

In Lebanon, all land parcels are classified as either irrigated (أرض سقي) or non-irrigated land (أرض). On the property title (سند تملك) of every land parcel are mentioned the duties related to the rights of profit and passage constraint: source of water, irrigation canal, valves... The water of the concerning source (spring, stream or river) is distributed to all the land parcels of a neighborhood, a village or more following a specified schedule based on دور (round) and عذان (time).

Local princes, notables or wealthy persons who have developed canalizations at their expense have thereby acquired water distribution rights that they ceded over time to purchasers and users together with the land (Mallat, 1995). Those acquired rights on water given to land parcels are directly related to the families that own those lands. For instance during the irrigation period, in every round (from one to several weeks) families will receive different times (from hours to days) of access to water. Nobody knows why a family is getting more than another one or has the priority on other families because the repartition of times dates back to the Ottoman period and finds its roots in the feudalism (see Box 2).

The person responsible for water distribution is the شالوي (gateman or ditch rider). He is generally a resident of the region, aged less than 60 years, and paid by the families. He is protected from conflicts over water distribution by a letter of acceptance signed by all the families and approved by the concerned mayor.

**Box 2: Water allocation according to acquired rights on water on the Khrayzat sources (Gedeon, 2007)**

The Khrayzat sources are located south-west of Khirbet Kanafar village at 940m of altitude. The irrigation scheme is located in the Litani watershed and water is distributed to all the lands having acquired rights through two canals. Every Hectare of land has the right to be irrigated for 30 minutes (time) every 9 days (round) for ‘Abou Ezzeh’ canal and every 10 days (round) for ‘Al Sakiyeh’ canal.

The allocation of water is as follows:

- Abou Ezzeh canal: 3 days to each of the Karam and Mghames families and 1 day for each of the Hatoum and Nouaim families and Kefraya village. During the dry years, they add 1 day of irrigation to every family and the round become of 13 days.
- Al Sakiyeh canal: 3 days to each of the Karam and Mghames families and 1 day for each of the Hatoum and Nouaim families as well as 2 days for Saghbine Village.

<sup>17</sup> Hyam Mallat, personal communication



Village elders and ecclesiastics usually participate in resolving conflicts and problems emerging over water distribution that are sometimes deadly. Nonetheless, reconciliation was always called after and everyone prayed on the buried (this is part of the tradition). This agreement between villages, families and communities to use water in a peaceful and useful way was the basis of the emergence of the Lebanese agriculture since the seventeenth century as Mallat (2008b) explains it in his article about the recognition of the property and repartition of water.

#### 4.3.2. The irrigation schemes: old and small, and new and medium

‘In Lebanon we only have old and small or new and medium scale irrigation schemes’: This was the first thing Dr. Bassam Jaber said to me when I first met him at MEW. Indeed, hydraulic infrastructures are not near to the abundant rainfall precipitation and water availability.

According to Comair (2006), irrigation potential in Lebanon (total cultivated area), based on soil and water resources, was estimated in 1999 at 261,000 ha. The total net irrigated area (including occasional irrigation and house gardening) was estimated at 104,010 ha, of which 90,000 ha were equipped irrigation areas (55,500 ha of old traditional gravity systems and 25,500 ha of pressurized systems<sup>18</sup>). The FAO/MoA census (2000) estimated between 6,000 and 10,300 m<sup>3</sup>/ha/yr the needs of water per hectare and per year depending on the cultivated crops, irrigation techniques and climate.

Based on previous information and on studies from MEW and the World Bank, there is sixty seven irrigation schemes, covering 6 large scales (over 2000 ha: Akkar Plain, Yammouneh, Dennyeh, Qasmieh-Ras el Ain, Qaa, Canal 900) and other medium scale schemes (between 80 ha and 1,000 ha). Assuming that the rest of equipped irrigation area consists of small-scale irrigation exploited by individual farmers, the total net and equipped irrigation schemes areas is showed in table 2 and a list and map of irrigation schemes can be found in Annex 9.

FAO/MoA census (2000) also gives irrigated areas classified by different sources of water such as surface water and groundwater. 48% of the total volume of water consumed for irrigation is supplied from surface water, while 52% are withdrawn from groundwater aquifer according to the census. Moreover, it is interesting to notice that all water diverted from surface sources are used for surface irrigation, whereas water extracted from groundwater resources are used in these manners: 43% for surface, 45% sprinkler and 12% for drip irrigation systems; the main source of irrigation water being the Litani River and the Litani-Awali complex of water resources.

Area	Net irrigated area	Equipped irrigated area		
		Large & Medium schemes	Small Schemes	Total
North Lebanon	30,000	N/A	N/A	N/A
Beirut & Mount Lebanon	11,000	N/A	N/A	N/A
South Lebanon	21,000	N/A	N/A	N/A
Beqaa	42,000	N/A	N/A	N/A
Lebanon (total)	104,000	65,600	24,400	90,000

**Table 2: Net and Equipped irrigation schemes area (in ha) in Lebanon according to Comair (2006 & 2008)**

According to Comair (2006), the MEW in collaboration with LRA has proposed the construction of thirteen new irrigation schemes to use existing available water resources more effectively. The total

<sup>18</sup> Kamal Karaa, personal communication

equipped irrigated area will account for only 110,000 ha after completion of all of the proposed schemes because most of schemes deal only with improvement of existing irrigation systems aiming at maximizing utilization of available surface water with modernization of irrigation system to improve irrigation efficiency.

Concerning irrigation practices in Lebanon, it should be clear first that a large variety of crops are being planted in Lebanon because of the multitude of microclimates and availability of fertile lands. Lebanon appears in many top twenties of largest producers in the world for several crops (cherries, cucumbers and squash), notwithstanding its small area. Crops varies from regions to another with citrus and bananas being planted in the coastal plains, olives in Koura and Marjeyoun, stone fruits in the mountains, tobacco in the South and maize, potatoes and all kind of vegetables in the Beqaa Valley (during Roman rule, the Beqaa Valley (ancient Marsyas) was considered to be the granary of Ancient Rome).

Unfortunately, most of the Lebanese farmers are still using old irrigation techniques in their lands and thus they usually over irrigate and contribute to the depletion of this scarce resource. The proper utilization of water by using tensiometers and other measurement devices is a task that many NGOs have put in their objectives<sup>19</sup>. According to FAO (2008), surface irrigation, mainly basin and furrow irrigation, is practiced by farmers on 53,500 ha (70.4 %). It usually comprises diversion structures or simple intakes on streams or springs, open concrete main canals and earth or concrete secondary canals. Sprinkler irrigation is practiced on 21,000 ha (23.4 %), especially for potatoes, cereals and sugar beet in the Beqaa Central Plain where those crops are subsidized by the government. Micro-irrigation is practiced on 13,000 ha (6.2 %), especially in North Beqaa (Qaa region) and in the coastal region where most fruit trees such as grapes, citrus and bananas are planted.

#### **4.3.3. Groundwater Exploitation**

The Lebanese soil consists of about 70% of calcareous rocks dating back from the middle Jurassic to Eocene. Those rocks are generally cavernous limestones (Abdallah, 2002) and mostly fractured due to karstic geological complicated nature of the country (Comair, 2008); these facts enhances the infiltration and penetration levels of water (Snow cover is the principal source contributing to groundwater recharge which is around 3.2 km<sup>3</sup>) to feed the underground confined and unconfined aquifers. Eight major aquifers can be considered in Lebanon totalizing a groundwater volume of 1.36 billion cubic meters; a map and a list of them can be found in Annex 10.

Groundwater prospection constitutes an essential fact to the agricultural activity particularly in the regions insufficiently endowed with the necessary alternative resources or which are not object of adequate development plans (Mallat, 1995). Already in 1926, the bylaw 320/1926 foresaw the possibility for the citizen to prospect groundwater provided that he asks a permit from the administration (Mallat, 2003). However, with time and due to the increased necessities, a specific legislation on groundwater exploitation was promulgated: the decree 14438/1970. Notwithstanding the fact that this decree was written rapidly without an in-depth methodological plan, it constitutes still a first approach to the organization of groundwater since it has regulated the allocation or dispensation of prospection permits (Mallat, 2003).

People in Lebanon started long time ago to hand-dig wells in order to get water for either private use or for irrigation (a few hundred are still functioning with a relatively low capacity (less than 20 l/sec)). They found in this technique an easy and secured way to get water all the year round and since irrigation projects were absent from the territory, and areas in the coastline or in the Beqaa valley did not have acquired rights on a close source of water, private well digging proliferated.

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<sup>19</sup> Maher Bou Jaoudé, personal communication

During the war also, and due to the chaotic environment, the number of illegal wells jumped drastically. It is not an exaggeration that the number of wells drilled since 1980 is more than the number of wells drilled in Lebanon since its existence (Khair et al., 1993).

The major pumping of groundwater is done by about 2500 wells situated in the agricultural areas of the South, Beqaa and Akkar. Other wells, estimated to be about 1000, are scattered in the area around Beirut (Abdallah, 2002). The depth of these wells varies from 50 to 300 m with a discharge range of 20 to 80 l/sec depending on the aquifer. The over pumping from these wells is considered as the major reason of salt water intrusion (Abdallah, 2002) as well as pollution from waste water and agricultural practices

#### **4.3.4. Mountainous hill lakes**

Hill lakes are small earth dams arranged by man. They are usually situated at the level of depressions between hills, which allows the collection of rainwater and brooks. Their establishment and their promotion are an interesting strategic choice allowing the mobilization of the natural hydraulic resources in order to answer the unceasingly increasing requirements of water, as well in agriculture and industry as tourism.

In Lebanon, hill lakes or artificial ponds are numerous in elevated mountains (usually at an altitude above 1200m) where fresh water springs are not available (see Annex 11). They provide water for a lot of orchards where apples, cherries, pears and plums are extensively produced and by that offer the villagers a respectful and worthy breadwinning.

The idea of building earth reservoirs have been initiated by late parliament member Fouad Lahoud who built the first hill lake in Kfarselouan in 1963<sup>20</sup>. Thereafter, farmers started to build more hill lakes with the help of the Green Plan and their number now exceeds 500 with capacities between 5000 and 60 000 m<sup>3</sup> and a total storage volume of 5.5 MCM (Green Plan, 2000). The construction of a hill lake is not a difficult task and do not cost more than 10,000 US\$ (An Nahar, 2005). Farmers found this technique profitable since the rainwater collected during the winter help them irrigate their lands till the end of summer and sometimes even in October.

The hill lakes represent a useful replacement for dams because, for instance, water collected in the hill lakes of Kfarselouan only are evaluated to 1 MCM<sup>21</sup>. Moreover, several new hill lakes have been constructed in North Beqaa region to collect not only rain water but groundwater also: WUAs have been created around the schemes also (see sections 5.5.1, 5.5.3 and 5.5.5). The MEW understood the importance of those small, easy and inexpensive reservoirs and that is why in its 10-years water master plan it calls for the execution and implementation of those hill lakes (see section 3.2.1.).

Moreover, the construction of earth reservoirs and the utilization of the water it collects could be a serious option that a lot famers would adopt to stop groundwater exploitation that is becoming an environmental unfriendly expensive technique (due to the increase of fuel prices).

#### **4.4. Reflection on Water Management Practices in Lebanon**

This chapter was important in showing the historical and present water management practices in Lebanon because it is crucial to understand the Lebanese water setting before starting any process of implementing WUAs. Indeed, the first part of this chapter showed how several historical events

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<sup>20</sup> Plato Hatoum, interviewed by An Nahar (2005)

<sup>21</sup> Plato Hatoum, interviewed by An Nahar (2005)

shaped the behavioral practices of managing water in Lebanon. The customs and habits and later on the texts and laws determined and influenced the course of management of water. By understanding this, one can easily study the implications of the implementation of WUAs as shown in the next chapter.

In Lebanon no one is actually effectively managing the water but almost everyone is involved in the organization of the water sector. Indeed, although the MEW and the WEs are the main bodies of water management in Lebanon, they unfortunately do not manage watersheds but only regions providing simply services. There is no such thing as the French example of *Agence de Bassin*, and the prerogatives are lost between the MEW, the WEs, the MoA and others. Nonetheless, WEs are the recognized official bodies responsible for water management in the different regions. They are replacing the old 22 AWOs and 209 LCs and they are becoming more independent. The merging of the old offices into four regional WEs was definitely a good idea because it considerably reduces the administrative paper work and financial waste and it allows for the creation of technical departments with qualified engineers. However, and also due to political interventions, not all the old offices have been linked to the new WEs yet. This is unfortunately slowing down the whole process of reforms undertaken 9 years ago. This is also regrettably having a negative effect on the establishment of WUAs.

Finally, this chapter describes the different agricultural water uses that are currently adopted by farmers in Lebanon. One can have a holistic picture of the overall Lebanese water setting and thus understand the challenges in front of the implementation of WUAs since most of the Lebanese farmers are more and more depending on other sources of water than the shared canals such as groundwater exploitation or hill lakes. Nevertheless, acquired rights on water and existing or projected irrigation schemes still constitute 10% of the Lebanese territory. Those schemes require eventually the establishment of WUAs for optimizing the utilization of water.

## Chapter 5: Water Users' Associations in Lebanon

This chapter, which refers to the second part of the MRQ, deals with WUAs in Lebanon. The general objective of this chapter is to show the impact and the effect of the establishment of WUAs on the strengthening process of IWRM.

This chapter starts with the legal and juridical complications and complexities for establishing WUAs in Lebanon. Then a description is given of the many ways initiators (individuals and outside partners) adapted to the juridical gap. Moreover, section 3 deals with other obstacles towards WUAs implementation in Lebanon such as the behavior of the farmers or the political and administrative issues. Then, before analyzing the existing WUAs, a description is given on the optimal role of WUAs in Lebanon. The last section of this chapter identifies all the existing WUAs in the country and analyses four of them, which are the most advanced and well referenced. The impact of the functioning of those WUAs on their surrounding environment is also stated.

### 5.1. Legal Context of WUAs in Lebanon:

#### 5.1.1. Decree 320/26: a complex regulation for WUAs activities

Creating a Water Users' Association is not always an easy task especially when there is no legal base for it, and related legislative texts are either complex or outdated. This is the case of Lebanon where the only jurisdiction over WUAs dates back to the French mandate.

Indeed, the French elaborated the same text for Lebanon, Morocco, Algeria and other colonies based on the French Syndical Association (governed by the law of the 21<sup>st</sup> of June 1865). The latter, that finds its roots in the Visigoths principles, has never been adapted to the local specificities or the social realities of the countries (Gedeon, 2007). Moreover, this text has never been updated in Lebanon since that time and is unsurprisingly out of context.

The by-law no 320 published on the 26<sup>th</sup> of May 1926 by the French High Commissioner Henry de Jouvenel (and that had a force of law since no parliament was existing) foresaw in its sixth title (articles 30 to 56) the possibility of constituting Syndical Water Users' Associations (SWUAs) in order to undertake the following work enumerated in the article 31:

- Protecting from seasonal or permanent water courses especially the dangerous ones
- Cleaning, deepening, rectifying and straightening seasonal or permanent water courses
- Drying and draining swampy and unhealthy wetlands
- Sealing and filling of swampy wetlands
- Irrigation

The process of creating a SWUA in itself is a complex issue since several administrative conditions should be filled. The request should be addressed to the president of the state (at that time Lebanon was not yet a Republic), studied by the Ministry of Public Work (the MHER was only created in 1966) and approved by the users, the head of municipalities and the ministries of finances, agriculture and public works. Even so, if the SWUA was not accepted, it could still be created by a decision from the president of the state for public welfare reasons. In addition, the users should represent at least the quarter of the **value of the real estate** or half of the users should own a quarter of the area. The constitution decree of the SWUA should state the projects to be executed, the budget and the taxes. It should function diligently otherwise the government will take over the management of the area.

It is important to know that bylaw 320/1926 should not be confused with the Law of the Associations published in 1909 (because it falls under the Special Law (see section 5.2.2)) and neither with the Working Code of the unions promulgated as a law in 1946 because the term ‘Syndical’ in SWUA only means a gathering of people and not a council of unionists<sup>22</sup>.

Nevertheless, since 1926 only one SWUA was created by the decree no 65 published on the 19<sup>th</sup> of August 1943 and signed by the president of the state of Lebanon Petro Trad. This SWUA was created in the northern region of Batroun, Koubba and Selaata for the utilization and the management of the irrigation scheme of the Walnut River (Nahr el Jaouz). Not only was this SWUA the only one created in more than 80 years but its activities do not seem to have affected the region also<sup>23</sup>. Undeniably, if there was only one association established on the basis of the bylaw 320/1926, this is undoubtedly because the establishment of similar associations caused until now much local and regional irritabilities - without even counting the lack of information and public orientation in this field<sup>24</sup>.

Indeed, this bylaw has included many administrative complications: in fact, the heavy routine procedures make it not applicable at all. One of the complex points raised was the direct supervision of the ‘President’ of the country in the different phases of creation, implementation and administration of the WUA (Gedeon, 2007). Another major complexity that turned out to be crippling concerns the fact the SWUAs are in fact Land Owners Associations since articles 30 and 32 refer only to land owners according them the right to cooperate together in a determined area to establish a SWUA.

Finally, in addition to all its complications, the bylaw 320/1926 does mention the ‘value of the real estate’ without bringing any clear definition to it: should a parcel of land be valued according to its area or to its agricultural yield?<sup>25</sup> Moreover, and unsurprisingly, since this text has been written originally in French, it has been unfortunately badly translated into Arabic deluding for instance public and general utility (for instance: public (العامة) vs. general (العمومية))<sup>26</sup>.

### 5.1.2. Proposed reforms for the legal basis of WUAs

In the current legal state, a SWUA cannot thus exist, or then only in the condition of exclusively gathering land owners which is quite impossible in the actual Lebanese land ownership setting (see section 5.3.2). Therefore, it is necessary to bring some reforms to the bylaw 320/1926 or create a new law that will supersede it.

Dr. Cortas who called for the creation of a National Irrigation Authority (see section 3.4) already proposed that in the law creating this NIA, a chapter should be reserved for WUAs cancelling the old bylaw’s prerogatives, updating its content and incorporating the WUAs under the NIA.

According to Mallat, almost all the water legislative texts in Lebanon are excellent because they preserves the customs and habits and the traditions; only the text related to WUAs is bad. That is why in 2006, under the supervision of the EU-funded project ‘Institutional and Social Innovations in Irrigation Mediterranean Management’ (ISIIMM) and with the cooperation of the FAO and the MEW, the water expert lawyer Hyam Mallat wrote a draft proposal for a decree project related to the establishment of Irrigation WUAs in Lebanon.

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<sup>22</sup> Hyam Mallat, personal communication

<sup>23</sup> Hyam Mallat, personal communication

<sup>24</sup> Hyam Mallat, personal communication

<sup>25</sup> Saïd Gedeon, personal communication

<sup>26</sup> Hyam Mallat, personal communication



This decree project is just an updating of the bylaw 320/1926 since foreign experts advised it rather than creating a new law that will take more time. This decree project is way simpler and clearer than the French text and comprises 20 articles only (instead of 27). It allows the land owners of a certain area to form a WUA and permits the landlords to be represented by the tenants. The constitution of such a WUA does not require a lot of administrative paperwork and the set goals are:

- Achievement, maintenance, exploitation and execution of repairing works and extension that will be beneficial for the scheme.
- Equitable distribution of irrigation water between the members
- Setting of tariffs according to exploitation and maintenance costs
- Collection of fees
- Refereeing when conflicts emerges between members or between members and non-members
- Protection of water quality

Unfortunately, in September 2006, when this decree project was written, a political unrest was governing the country and the text could not be promulgated by the parliament. Today, this text is lost between the FAO and the MEW. When I asked Dr. Comair (General Director of MEW) about this text, he told me that it is with the FAO, and when I asked Dr. Cortas (FAO consultant) he told me that the text is with the MEW.

Dr. Kamal Karaa (head of rural development at LRA) explained to me that in order to raise a decree project to be promulgated by the parliament, a lobby of deputies, ministers, experts and farmers is needed and this is what is actually missing. However, when I asked lawmaker and Parliament Member (PM) Robert Ghanem about the way to do it, he told me that the concerned minister can himself raise the decree project to the cabinet of ministers that will in turn propose it to the parliament.

In conclusion, the proposed reformed decree for the establishment of Irrigation WUAs in Lebanon is unfortunately lost in an arbitrary drawer; although all the water experts agree that the promulgation of this decree is an important step for the legalization of WUAs. Once again the farmers and water users are paying the price for the nonchalance of the politicians.

## **5.2. Adapting to the juridical gap in the legal basis of WUAs in Lebanon**

### **5.2.1. Historical background of WUAs activities**

It is now clear that the legal base for WUAs in Lebanon is weak and complicated. However, several individual or collective efforts were made since 1926 in order to adapt to the juridical gap in the legal basis of WUAs by finding others means to manage irrigation schemes in a participatory way.

In section 4.4.4., we saw how villagers used to manage their water collectively based on acquired rights. Water was distributed among farmers and fees were collected for the maintenance of the canals. We can find this kind of grouping probably around all the mountainous springs in Lebanon. However, these groupings of farmers are not formal Water Users' Associations because they are not registered as such.

Concerning WUAs, we already know that only one formal WUA has been created based on the bylaw 320/1926 on the Walnut River (Nahr el Jaouz) in 1943. What were the other initiatives that have been done since?

It is true that the complexity of this bylaw restrained a lot of farmers or group of farmers to initiate WUAs. Also, the civil war that extended from 1975 to 1990 prevented that kind of inventiveness to

occur. In the 1990's the mood was for reconstruction; Lebanon borrowed many millions from the World Bank and the International Fund for Agricultural Development and proceeded to rehabilitate the major irrigation schemes, including the South Beqaa Irrigation Scheme (SBIS) and the Yammouneh scheme. Saïd Bitar, former head of Great Projects at MEW, was the first one who attempted at creating a WUA on the SBIS in the years 1995-1996<sup>27</sup>. He also implemented a social assistance for irrigation farmers of small schemes such as in Yammouneh in order to raise awareness concerning the advantage of being gathered in cooperatives... Unfortunately, the project did not work because most of the time there was simply no water for everyone.

The first successful attempt to create a WUA was achieved in 1997 through personal initiative when Dr. Hanna Khoury gathered many farmers from his village of Mchaytiyyeh under the 'Agricultural Cooperative Association of Mchaytiyyeh' (see section 5.5.1) in order to manage the newly implemented irrigation scheme. This association received the support and financial help from many local and international bodies such as USAID and the Japanese Embassy.

The creation of the 'Lake Share Communities Union' (see section 5.5.2) on the SBIS in 2003 was however the fruit of an EU-funded project (WASAMED) with the cooperation of LRA, LARI and Chamber of Commerce, Industry and Agriculture of Zahleh and the Beqaa (CCIAZB). An international funded project launched by the Italian Cooperation in Lebanon was also behind the creation of the 'Irrigation Water Users' Association of Jabbouleh' in 2004 (see section 5.5.3).

In July 2006 the Israeli bombings over Lebanon and especially in the south resulted in a lot of material damage and rural migration. Many international donors and NGOs were involved thereafter in the socio-economic rehabilitation and relief programs. The Italian NGO AVSI worked also under the Italian Cooperation in Lebanon – ROSS Emergency Program in the rehabilitation of the Dirdara irrigation network and the management of its water resources. In 2008 the 'Marjeyoun-Khiam Plain Water Users' Association' (see section 5.5.4) was created.

Moreover, several other WUAs (see section 5.5.5) were created in Lebanon especially after the conflict of July 2006 thanks to the many donation campaigns that it resulted in. Saïd Gedeon from CCIAZB is however skeptical about the international donors' programs that are active in Lebanon because, according to him, they only bring money and rarely educate saying: *'Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime'*.

## 5.2.2. Cooperatives or Informal WUAs...

Despite the juridical gap in the legal basis of WUAs in Lebanon, several initiatives were found to be efficient in order to fill the *lacunae* and makes things work better. The existence of a legislative text for WUAs regulation in Lebanon (decree 320/1926) is in fact a double-edged blade because on the one hand it legalizes the activities of WUAs but on the other hand it makes it almost impossible to be created due to its complexity. That is why all those WUAs created since 1997 and cited above are in reality masked behind cooperatives.

Nagib Hage Chahine, a prominent lawyer, described me the legal possible issues in this case. He first explained me that the bylaw 320/1926 is considered as a specific text of associations and thus falls under the **Special Law** which means that we cannot at all use the **General Law** of the Associations published in 1909 and abrogated in 1983. He also told me that in 1972 was published the decree related to the creation and management of Cooperative (association of persons united to meet their common economic, social, and cultural needs through a jointly-owned enterprise).

In Lebanon, instead of establishing informal WUAs, initiators preferred then to create agricultural cooperatives because not only did they have at least a legal status but they can also tackle rural

<sup>27</sup> Bassam Jaber, personal communication



development and agricultural issues: according to ESCWA officer Tarek Sadek, WUAs is not only about managing water. Agricultural cooperatives flow under the directorate of agricultural cooperatives in the MoA and are numbered to more than 560.

A new status has been conceived also by the Rural Development Project (RDP) in Northern Beqaa that created a **Water Users' Cooperative** in Btedai. This is a first in Lebanon and could be used as an example for other WUAs in the future (see section 5.5.5).

In conclusion, and as Catafago says, in Lebanon we do not have formal WUAs but only embryos of associations, masked behind agricultural cooperatives, that have been created under the impulsion of external donors or projects. Unfortunately, nothing has been done yet by the ministries concerned or by the government; not even the promulgation of the law regulating WUAs activities despite the many promoting campaigns for it.

For the purpose of my study I am considering those associations as WUAs in their Lebanese context because their activities matches what formal WUAs do and they have also a legal status (hence, they cannot be considered as informal WUAs).

### 5.3. Other complexities for WUAs implementation

#### 5.3.1. The Lebanese Farmer

Agricultural activities in Lebanon date back to the Phoenician times when farmers used already to grow grapes and make wine especially in the Beqaa Valley. Lebanon is blessed with an abundance of arable land, premium soil conditions, plentiful water resources, and rich diversity in topography and climate (Gambill, 2003). Since one-fourth of Lebanon's area are cultivable lands, agriculture was always a booming activity and the farmers always the successful artisans of that.

What is really amazing about the Lebanese farmers is their ability to adapt to many kinds of situations. Since the 7<sup>th</sup> century, Christians had to flee from persecutions and had taken refuge in the mountains (Mount Lebanon): there they reclaimed the valleys and they transformed them into fertile lands where all kinds of fruit trees and vegetables were grown. They diverted the rivers and springs and irrigated the lands that looked like a huge fertile *amphitheatre* where water flows from everywhere (Volney, 1787) (see Annex 12). They already implemented what is today known as a hydraulic society: dividing labor in specific type, intensifying cultivation and cooperating and sharing water (Wittfogel, 1957).

Unfortunately, this period of economic growth was later oppressed with the beginning of Ottoman rule and the high taxes imposed on the Lebanese production. Additionally, the successive wars (First and Second World Wars, Lebanese civil war) and the Syrian hegemony over Lebanon made from this small country one of the least agriculturally self-sufficient states in the world (Gambill, 2003).

This has regrettably affected the behavior of many Lebanese farmers who switched from their ancestors' mutual and communal agricultural management practices into individualistic manners: the continuous threat over their production made them more and more egoistic fearing for their survival.

That is why nowadays, and especially since the end of the civil war in 1990, it is very difficult to be able to put a group of farmers together on the same table. The war sadly taught them the law of the jungle; they still think that water is taken for granted<sup>28</sup>, they still steal water illegally from the open

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<sup>28</sup> Salah Saliba, personal communication

canals<sup>29</sup> and they unfortunately think that joining a WUA will remove some of their prerogatives. Bottom up initiatives are inexistent and most of the top down efforts to create WUAs failed at the example of the WUA on the Walnut River (Nahr el Jaouz)<sup>30</sup>.

A national awareness raising campaign should be done, on the example of the ISIIMM project and the LRA efforts, in order for the farmers to understand the objectives and aims of a WUA and realize the beneficial importance of being organized under one association. Moreover, the farmers, which most of them lack managerial knowledge and skills, will be able to get trainings and extension programs related for instance to the use of valves and tensiometers that will help them in better controlling water. Cortas says optimistically that although the Lebanese farmers are individualistic, when they will see the economical interest of joining a WUA they will do the best to work together.

### **5.3.2. The Lebanese political, administrative and social Décors:**

‘The Lebanese water décor is not yet suitable for WUAs implementations’ told me Dr. Selim Catafago when I asked him about the other obstacles than the juridical ones. According to him, the water décor in Lebanon is closely related to the political framework since the problem of administrative decentralization (Lebanon is following a heavily centralized authority system since 1959 for political considerations) is directly affecting the water sector. Because all the decisions are centralized at the ministry or the WEs and there are no local involvement, like public participation or decision making. Legislation in force is thus national and there is no regional legislation for water (Mallat, 1995).

Property recognition is also another administrative problem towards WUAs implementation. This problem dates back to the Ottoman period when large landlords used to appropriate lands in a very inequitable way without clear delimitation of the area. It is in Northern Beqaa where this problem is the most acute: the tribal composition of the population there increases the unclearness around property delimitation.

On another hand, a big problem resides in the fact of joining a WUA. Since, in Lebanon, there is a considerable problem over ownership, it should be clearer who could join a WUA. Indeed, a lot of farmers do not actually own the land they are cultivating. According to a survey conducted by the ISIIMM project in South Beqaa, 99% of the farmers appeared to be only tenants of the lands<sup>31</sup>. They only rent it from large landlords that are in fact few families (Hamadeh, Haidar, Sleiman, Skaff, Rizk, Hage Chahine...) that assume most of the land, especially in the Beqaa Valley. Who should then join the WUA? The tenant farmer or the owner?

If we agree that the tenant farmer who is actually cultivating and working the land should join the WUA since he is the one who needs water and other services, then another problem arises. The availability of water in the Beqaa through irrigation canals or wells, especially since the seventies, allowed the establishment of seasonal crops. This phenomenon makes the farmers move from one land to another following the crops planted. Indeed different crops are best suitable in different areas and thus farmers find themselves every year or season renting a land in a different area. Hence, could tenant farmers join a WUA seasonally?

If we agree then that land owners should join the WUA as stated in the bylaw 320/1926 and in the project decree written by Hyam Mallat in 2006, also other problems come up. First, and due to the absence of the government and to the chaos that reigned during the war, many land owners dug illegal wells inside their areas. Those wells, if they do not follow the regulations, are negatively

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<sup>29</sup> Maher Bou Jaoudé, personal communication

<sup>30</sup> Adel Cortas, personal communication

<sup>31</sup> Saïd Gedeon, personal communication

affecting the underground water that in fact is feeding the irrigation canals. Ironically, those farmers are hurting themselves and their fellow partners in the WUA. Second, concerning membership in a WUA, should all owners of a land join? In Lebanon, and especially in South Beqaa, familial properties have been parceled out with every heritage succession: every heir reclaiming his part of the land. Moreover, and since a lot of those inhabitants emigrated to South America, the majority of land parcels were found to be in possession of a multitude of unknown 'owners in common' (known only as the heirs of person X). Hence, should all the owners of a certain land be represented in a WUA?

Unfortunately, apart from the juridical gap around WUAs implementation in Lebanon, a lot of other issues should be tackled and carefully revised before ones think of creating a WUA.

#### **5.4. Potential and expected role for WUAs in Lebanon**

The creation and implementation of WUAs in Lebanon, although it only comes from international donors' pressures and initiatives, seems to be in fact the wishes of both the farmers and the LRA. It is true that initiatives are unfortunately not coming out from the farmers themselves because they lack the knowledge and they require capacity building but, in point of fact, they do call for more independency<sup>32</sup> and accept WUAs. Moreover, it is not the task of the LRA or any other WE to gather the farmers<sup>33</sup> but it has interest when WUAs are created: the association would reduce the LRA of certain prerogatives (in particular, the maintenance of the tertiary networks), while the office could ensure the association various services and advices. According to Karaa, 'the interests of the LRA and the farmers lie in the management of the tertiary network by the latter'.

However and as already mentioned above, farmers do lack knowledge and they need to be assisted, by the LRA, the WEs, NGOs and other research institutes that will provide extension programs, if they want one day to take over the overall management, operation and maintenance of every scheme as Karaa mentions it.

The progressive evolution of WUAs activities has also been explained by Karaa: the first associations will only be small units working on limited tertiary sectors. They will be framed by popularization organizations (LRA, WEs, NGOs...) that will help them in their capacity building. After they consolidate experience and acquire knowledge, the formation of consortia would be a natural evolution considering the similarity of the roles of associations on the level of the same project.

What could be then the short, medium and long term roles of WUAs in the different irrigation schemes of Lebanon? Concerning the old traditional gravity schemes (executed before 1968), WUAs can participate in the elaboration of modernization plans, adoption of drip and sprinkler irrigation techniques in respect to the existing crops and replacement of expropriation by the right of constraint (see section 4.3.1) for the new secondary and tertiary networks projects (Karaa et al., 2008).

Concerning the pressurized schemes executed since 1968, WUAs can assume the management, operation and maintenance of the tertiary network in particular the functionality of tertiary network according to the norms and its protection against vandalism (Karaa et al., 2008). WUAs can also participate in the planning of new irrigation projects. They can work on the development of demarcation plans, on ensuring the right of constraint for the tertiary networks without expropriation, on ensuring the right-of-way between irrigators and on facilitating and following the

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<sup>32</sup> Selim Catafago, personal communication

<sup>33</sup> Kamal Karaa, personal communication

execution works on the tertiary network in seen to assume the later maintenance of the network (Karaa et al., 2008).

Groundwater Users Associations can have an important role in Lebanon due to the anarchic development of private wells that are causing draining of the wells in the Beqaa and saline intrusion in the littoral. Their role would be popularization in seen to save out irrigation water, control pumped quantities and exploit the wells collectively (Karaa et al., 2008).

Finally, the long term role of WUAs is the takeover of the management, operation and maintenance of the whole scheme when WUAs consortia will be created after acquiring experience and knowledge (Karaa et al., 2008).

## **5.5. Identification and Analysis of Existing WUAs in Lebanon**

During my field research work in Lebanon in autumn 2008, I was able to identify all the WUAs that are functioning throughout the country. As I already explained in section 5.2.2, for the purpose of my study, I am considering a WUA in Lebanon as any kind of association, organization or cooperative that conducts the activities of a formal WUA. In section 5.2.1, I described shortly a historical background of WUAs activities where I mentioned also the four main WUAs I will analyze in this section: Mchaytiyyeh, South Beqaa, Jabbouleh and Marjeyoun. I will also point out the existence of other emerging WUAs that are just starting to function or still in the process of implementation.

### **5.5.1. Mchaytiyyeh**

The locality of Mchaytiyyeh is situated at an altitude of 1406m in the northern Beqaa valley, about 20 km west of the historical city of Baalbeck (ancient Heliopolis). The Agricultural Cooperative Association of Mchaytiyyeh was created in May 1997 thanks to the personal initiative of Dr. Hanna Khoury who gathered many farmers of his village of Mchaytiyyeh and started to seek for donors to finance their WUA.

Although situated at the foot of the highest mountain in Lebanon (Qornet el Saouda, 3088m), the small valley of Mchaytiyyeh is thirsty because of the karstic geological features of the area. Indeed, the Yammouneh Fault prevents water coming for the nearby sources (Oyoun Orghosh springs – 12 km, and Yammouneh lake – 6 km) to reach the small valley. The farmers got used to these realities and they were always planting crops that do not require irrigation – mainly cereals. Stone fruits were impossible to grow not only because of the lack of water but also because hilly lands were not reclaimed into terraces. Things worked until the 1960s and 1970s when cereal cultivation declined due to the dumping of subsidized grains on the local market. Concurrently, the cultivation of fruit trees in the mountainous areas picked up thanks to the specialization and export-orientation of the new Lebanese agriculture. This was okay for water-rich areas in this region like Oyoun Orghosh or Ainata but definitely not in Mchaytiyyeh: that is why a lot of villagers emigrated unfortunately.

It is not until 1997, date of the establishment of the cooperative that water became again available to the village and that farmers started reclaiming lands and transforming them into apple orchards. During my field visit to the area, it was clearly visible that all the apple trees are not more than 10 years old and that all the plots are newly developed. What happened is that in 1997, when Dr. Hanna Khoury noticed that all the private wells dug by the farmers were not profitable (because of the deepness of the aquifer), he decided to look for donors that will help him and his fellow farmers to dig a well above the Yammouneh Fault where water would be available.

The well is of 150m deep and is situated 7 to 8 km uphill from the village. The water is conducted from there to a hill lake, of 25,000 m<sup>3</sup> of capacity, built by the farmers about 1 km ascending from the village. Then, water is distributed from the reservoir to the newly created plots in the areas around the village through two pressurized main canals (pictures and a schematic representation of the area can be found in Annex 13). The infrastructure cost since 1997 around US\$ 1 million financed mainly by USAID, EU and the Japanese Government. This ingenious system of supplying Mchaytiyyeh with abundant and constant irrigation water is the proof of the capability of those villagers to control this resource in a useful way for everyone. Dr. Hanna Khoury was kind of a visionary at that time in Lebanon because he even decided to go a step forward and create a WUA to regulate the utilization of water in the newly built canals.

Because the law related to the creation of WUAs is too complex, Khoury decided to give his WUA the legal status of an agricultural cooperative, falling under the directorate of agricultural cooperatives at the MoA, with the declared objective of supplying modern productive and irrigation installations, management and maintenance to reduce production costs and enhance its quality. The WUA started to grow rapidly reaching 100 members today<sup>34</sup>. All of them have been obliged to switch from surface to drip irrigation system thus reducing water waste. A caretaker has been appointed to be responsible of the irrigation scheduling and distribution of water. An efficient system of surveillance has been placed where offenders are first warned but they can also be inflicted for crime. The communication between members is done by letters sent to the houses or newly by messages sent to the cellular phones. They used to meet at the church of the village but now they have been able to furnish an office for the association. They have their own internal laws, they have elections every 2 years and they have an administrative council as well as a surveillance committee. What is remarkable also is that all the farmers' lands in Mchaytiyyeh are almost equal and this is reflected in the farmers' horizontal governance of the WUA: evenhandedness and equity.

The WUA of Mchaytiyyeh profited also from its legal status of cooperative to conduct activities of rural development beside its water-related actions:

- Supporting the cultivation of replacement and irrigated crops
- Distributing new varieties of apple and kiwi seedlings with the appropriate fertilization programs
- Shared administration in providing agricultural tools and necessities
- Distributing of drip irrigation pipes
- Providing fertilizers
- Supporting the application of Integrated Pest Management (IPM) on apple trees
- Providing a plowing tractor for the farmers to use it
- Providing a common fridge for the storage of products
- Participating the members in extension seminars with the cooperation of specialized universities

The most important point one should notice when visiting the region is that without the WUA and the common effort of all the farmers, there would be no water in Mchaytiyyeh. Indeed, the participation of farmers in the governance of the resource is definitely showing positive results. When the farmers used to work independently, the community was suffering from severe scarcity of water and absence of production. It is also true that a WUA is a strong body that could seek funding and assistance from donors and outside partners. That is why farmers are more than happy to be part of this WUA because they can start cultivating their lands again after 50 years of worthlessness. They pay only 1 US\$ per drip point for the water and 0.66 US\$ per apple box to the association. In return, the WUA pays the caretaker, the tractor driver, the maintenance, the assistance, the marketing and other different fees. Moreover, new projects for the community (constructing another

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<sup>34</sup> Hanna Khoury, personal communication



hill lake and supplying the Yammouneh plain with irrigation scheme) are being financed partly by outside donors but also by the farmers themselves which strengthen their participation in the overall process (decision-making, financing, involvement...).

During a talk with Jean Khoury and his father (two farmers members of the WUA), I noticed their happiness while working the land. They were reclaiming new lands from the small hills around the already planted plots. They told me how each year, thanks to the good revenues; they can win lands over the prairies. Indeed, in 2006 already, the WUA was able to market 250 apple boxes and in 2008 the number reached 1000 boxes. Additionally, the WUA was able to reclaim more than 150 dunums (150,000 m<sup>2</sup>) from the surrounding hills. A *dunum* (دُنْم) is a unit of area used in the Ottoman Empire and still used in Lebanon. It was defined as 'forty standard paces in length and breadth' (the area a farmer can plough in one day). Other Ottoman measuring units are also still used in Lebanon like the *chembol* (شَمْبِل). 1 dunum = 1000 m<sup>2</sup> and 1 chembol = 8000 m<sup>2</sup>.

It is amazing to see how the mutual effort of farmers coupled with willingness and assiduity can induce a positive effect on a whole region and community. Twelve years ago nobody could believe that these fallow and abandoned lands would one day receive water and produce fruit trees. Even the seniors hardly believe what is happening to their village. 'The villagers will not anymore quit their lands' told me one farmer; this is a clear example of the attachment of the Lebanese farmer to his land. Dr. Hanna Khoury is very proud of this achievement saying he was only the promoter of the project, 'the whole work could have not been done without the cooperation of all the farmers'. Indeed, the case of Mchaytiyyeh is a clear example to be followed concerning the successful participation of farmers in the management of water resources.

### 5.5.2. South Beqaa

The 'Lake Share Communities Union' is a Water Users' Association that has been created in 2003 on the South Beqaa Irrigation Scheme with the support of Dr. Kamal Karaa (head of Rural Development Department at LRA) and Dr. Fadi Karam (head of Irrigation Department at LARI) and the incentive of the WASAMED project (a thematic network project funded by the European Union aiming at establishing a platform for effective Mediterranean communication and debate on water saving in agriculture). Nazir Torbey, former head of the municipality of Lala, is the person in charge of this WUA that has been registered also as an agricultural cooperative at the MoA because of the legal complexities already explained in the previous sections. The goal of the 'Lake Share Communities Union' is to organize the irrigation water profiting from the South Beqaa Irrigation Scheme (Canal 900).

What is the Canal 900? In August 1954 was created the Litani River Authority (LRA) that envisaged the construction of the Qaraoun 'Albert Naccache' Dam on the Litani River in 1959. The decree 14522/1970 finalized the allocation of the Litani waters. Three canals, situated at 900m (South Beqaa), 800m (Marjeyoun) and 600m (Nabatiyeh) of altitude, were planned to be built but only one has been achieved before the war (Canal 900) although it has only been operational in 2000. The current existing scheme has 18 km of length, covers a total area of 2000 ha and occupies a narrow and stretched out fringe on the left bank of the Litani and includes the adjacent parts of the five fundamental localities in South Beqaa (Qaraoun, Lala, Baaloul, Jeb Jennine and Kamed El Laouz) (Gedeon, 2007). Pictures and a map of the area can be found in Annex 14.

Before the construction of the Qaraoun dam in 1959, crops cultivated in the area were mainly wheat and barley and thus were rain fed. During the 1960s, there was a widespread increase in the irrigation 'borehole phenomenon' (groundwater) (Gedeon, 2007). The case remained the same during and after the war until 2000 when the Canal 900 became operational for the first time: water was starting then to be distributed to farmers in underground pressurized canals.

The LRA manages the Canal 900 scheme and that is why it was behind the creation of the 'Lake Share Communities Union' in 2003. The establishment of this WUA took a lot of time because of administrative and legal chaos and was first composed of 14 members (not all of them being users of the scheme)<sup>35</sup>. This WUA is not dealing only with the water preoccupations, but goes forward to general agricultural and economical interests (Gedeon, 2007). Its objectives are:

- Better organization and utilization of the irrigation water from the Canal 900
- Lower agricultural production costs by lowering irrigation costs
- Facilitation of products marketing
- Improvement of the economical situation of the farmers.
- Collaboration with different actors working in the water management sector.

Unfortunately, because of lack of awareness and raising campaigns that should have been conducted along with the creation of the WUA, and because of the absence of assistance from the MEW and the LRA, the farmers did not understand the goal of this WUA and started to desert. However, starting in 2005 and thanks to the ISIIMM project, extension programs and seminars have been completed and farmers' trips to meet WUAs in Morocco, Egypt and Italy have been arranged. Farmers have been able to get in contact with other WUAs and understand their functioning and they gain again trust in their 'Lake Share Communities Union'. Today, the WUA comprises of 44 members, all of them being users of the Canal 900 scheme. They receive support from the LRA, the CCIAZB (extension programs, seminars, and trips), the WASAMED (conferences), and AVSI (moral and financial support: computer, printer, video TV, drip pipes, sprinklers, filters, tensiometers). A service center (IRWA) providing laboratory analyses, weather data and extension services has also been constructed in Khirbet Kanafar with the objective of strengthening local partner institutions.

During the many field visits I made to the South Beqaa region, I was able to have several talks with Canal 900 users (members and non-members of the WUA). In general they were all enthusiastic about the establishment of a WUA in their scheme because they believe that their voices would be heard (farmers are suffering from many problems: corruption, bad water quality, bad maintenance of the canals). However the current members are skeptic about the future of the association because they sometimes realize that their membership is useless: according to them, they are paying fees to the WUA that is not offering them any extra benefit, not even priority to irrigate before non-members farmers.

On the other side, the LRA does not understand the behavior of many farmers: they don't respect the norms in vigor (they change and eliminate flow regulators), they misuse the hydrants, they pump water from the open canals and they think that because of their membership they should have priority over others or that they can get fertilizers for free<sup>36</sup>.

When the ISIIMM project conducted a field survey on the Canal 900 farmers, they noticed that the farmers' educational level is not very high; most of them not reaching the secondary level<sup>37</sup>. This is reflected in the field on their behavior: they over irrigate and do not make use of the tensiometers available, they wrongly use the hydrants, they do not use the right irrigation equipments and they often deep-plough which leads to the destruction of the networks.

All this misconduct has a negative effect on the functioning of the WUA: because of the relatively low water price (20 US\$ per inch/dunum/season), farmers are unconscious of their over irrigation and they lack water saving. The scarcity of water leads some tail end farmers not to receive water even though they could be members of the WUA.

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<sup>35</sup> Nazir Torbey, personal communication

<sup>36</sup> Ali Abboud, personal communication

<sup>37</sup> Saïd Gedeon, personal communication



One problem of the hard functioning of the 'Lake Share Communities Union' resides in the fact that this WUA did not come up from a common willingness from the farmers but rather from an imposed will from the LRA: that is why it has problems regarding governance and self-management<sup>38</sup>. As for the farmers, they do lack a lot of capacity building to be able to manage their WUA, conflicts and scheme properly: what is happening is that they ask for more independency but they always call for help and assistance<sup>39</sup>. The other problem is related to the LRA itself because of the political implications, clientelism and corruption: politicians do not want to replace LRA employees with depend on the farmers because of electoral reasons (LRA administration and South Beqaa farmers are politically opposed). Kamal Karaa however assures that when the farmers will be willing to gather together formally into WUAs, the LRA will directly start the process of transferring power and water management to those WUAs.

### 5.5.3. Jabbouleh

Jabbouleh is a small village situated on the shore of the Orontes River in the North Beqaa region. In 2004 was created the 'Irrigation Water Users' Association of Jabbouleh' thanks to an international funded project (Rural Development Project (RDP) of the Northern Beqaa) by the Italian Cooperation in Lebanon (2003-2006). The area covers 2,640 km<sup>2</sup> and houses 270,000 inhabitants, mainly rural communities. It is one of the poorest and least developed regions of Lebanon partly because of semi-arid climate (less than 400 mm of precipitation) that inhibits the development of agriculture.

In October 1999, the Italian government approved the final proposal of the project that started in March 2003. The project involved Italian (Ministry of Foreign Affairs and IAM-B) and Lebanese (CDR, LARI (Dr. Fadi Karam) and Caritas) partners. The general declared objective is 'to contribute at stopping the process of environmental and social degradation in North Beqaa region through the support of irrigated agricultural production and marketing in such a way to reduce poverty in the region'. The specific objective is however to optimize the utilization of water resources.

The main component of the project was an irrigation pilot system in the region of Jabbouleh. The project was involved in the installation of a collective pressurized irrigation network covering 100 ha disposing of a hill lake of 20,000 m<sup>3</sup> of capacity and five reservoirs of 2,000 m<sup>3</sup> feeding each an area of 20 ha. Since rainwater is scarce in this region especially during the period between April and October, this system has effectively controlled water permanent availability. Moreover a technical irrigation center was created to manage the mechanization processes, the meteorological and radiometric stations, and to conduct several studies (hydraulic, agronomic, and geologic). A nursery was also implemented but the most important achievement was the establishment of a Water Users' Association<sup>40</sup>. Pictures of the area can be found in Annex 15.

All the farmers were gathered in this WUA since 2004 where they were able to learn about the collective management of modern irrigation systems and discover the benefits of being gathered under one roof. Before, they were used to work independently but now, not only they are participating together in the elaboration of the schedules but they are also involved in the decision-making process that concerns the community. Most of them never used pressurized systems before and none of them knew about the AcquaCard® system for water distribution. AcquaCard is an automated system for the distribution of irrigation water; it is the most advanced technical solution to guarantee better use and save irrigation water. It is an Italian product and it has been introduced successfully among the farmers. They charge this prepaid card with money, insert it in the hydrant

<sup>38</sup> Saïd Gedeon, personal communication

<sup>39</sup> Selim Catafago, personal communication

<sup>40</sup> Fadi Karam, personal communication

where they can control the valve and flow limiter and finally they get the water they need. This is a new way of governance where technology plays a major role in it.

The farmers are so happy to use this electronic system; ‘at least we will not engage anymore into conflicts’ remarked one of the farmers. Indeed, since the water distribution schedule is adopted and agreed upon by all the farmers prior to the start of the irrigation period and since the electronic card does not allow someone to irrigate when it’s not his turn, conflicts have been reduced considerably. Quantity of water and hours of irrigation are now regulated previously thanks to the computerized system. This ingenious system has also been able to control over irrigation as it can be clearly noticed when someone visits the region. Moreover, this system allowed the farmers to agree on the water price prior to the allocation of water depending on the available quantity of water. Finally this system has reduced the costs of managing the irrigation network since now the farmers can themselves get the water and do not require anymore the need of a caretaker: ‘everything is computerized now, this is amazing’ noticed one farmer.

The pairing of human skills with electronic devices is a new successful way of governance as the case of Jabbouleh shows. But what also makes this system works perfectly is the enthusiasm described by the farmers to be implicated in the management of the water resources via their WUA. This is a great example to be taken and adopted in other regions.

This WUA works perfectly thanks to the continuous support of the Italian Cooperation even after the end of the project. Until now, two engineers still visits Jabbouleh frequently to make sure everything is working well and also to provide formation and technical assistance to the farmers. 15 formation sessions are being held every year and technical assistance includes access to soil and water laboratories, meteorological station and libraries. The modernization of the irrigation scheme of Jabbouleh with the help of an electronic card is a clear example of the success of the mutual management in a WUA.

#### **5.5.4. Marjeyoun**

Although the Italian Cooperation in Lebanon has been active since the early 1980s, it intensified its activities after the July 2006 bombings with post-conflict contributions gathered under the ROSS (Rehabilitation, Occupation, Services, and Development) Emergency Program. In this context, the Italian NGO AVSI has been in charge of the execution of ‘Emergency Interventions in the Marjeyoun-Khiam Plain’ to rehabilitate and develop the rural economy in the area. The objective of this project was to rehabilitate the Dirdara irrigation network and improve the irrigation management efficiency by creating the ‘Marjeyoun-Khiam Plain Water Users’ Association’.

The Marjeyoun-Khiam Plain (or ‘Marj’ according to locals) represents the agricultural core of the district of Marjeyoun situated between the villages of Marjeyoun, Khiam, Qleïa and Bourj el Moulouk. It is a fertile land of about 800 ha, very rich in water springs: Marj-e-youn means meadow of springs. The Dirdara natural pool (4,000m<sup>2</sup>) is considered as the most important water source for irrigation since it is fed by many groundwater springs. Before the Israeli invasion in 1978, the scheme was constituted with gravitational concrete canalizations and the government was managing this network and nominating the caretaker responsible for the scheduling and distribution of water. However, and due to the Israeli occupation of the land until 2000, the concrete canals became unusable and the lands unfarmed. Only four farmers remained cultivating their lands easily (there was simply enough water for them).

It was not until 2000, when the Israelis troops withdrew, that all the farmers returned to cultivate their lands after 22 years of fallow. Because of the bad condition of the concrete (or sometimes earth) canals, and because of the archaic water distribution, water could not reach all the lands and farmers turned to exploit groundwater by digging private wells. Foolishness led some to even install

pumps to shaft water directly from the pool. Hussein Abdallah, a farmer, spoke about the negative effects of the misuse of the Dirdara waters on the farming process that led farmers to plant their season more than once or to shift to non-irrigated agriculture.

The bombings of July 2006 and the intrusion of the Israeli troops to the Marjeyoun-Khiam plain even brought more damages to the existing infrastructure strongly penalizing the potential of the area. This induced the Italian Cooperation and AVSI to focus, in its post-war emergency program, on the rehabilitation of the Dirdara irrigation network and the development of the rural economy of the region because the governmental body responsible of the management of the Dirdara network (LRA) is not interested in small-scale schemes management<sup>41</sup> probably because of lack of employees<sup>42</sup>. The first task of this project was to rehabilitate the upper part of the Dirdara irrigation scheme by replacing the old open canals (8 km) with underground pipelines (at -1.5m): two out of the three canals have been restored (pictures and a map of the area can be found in Annex 16). The pipelines have different outlets; each one will provide water to a portion of the territory where flow meters are installed to measure the quantity of water distributed and where drip irrigation systems have been installed. Estimation of the water requirement for each plot was made available through the use of a mathematical model and available territorial data: topography, meteorology, crop parameters.

The Dirdara waters have been uncontrolled for more than 25 years and this resulted in a total chaotic situation in the Marjeyoun-Khiam plain. It is noticeable to see that when the water has been controlled (illegal wells forbidden, shaft pumps removed, irrigation pipes installed, etc), its availability has impacted positively the agricultural productivity in the region.

Concerning the management of the irrigation scheme in a sustainable way, two alternatives were studied by AVSI: either government-managed system or farmer-managed system. For the Dirdara irrigation scheme, farmer-managed irrigation system was chosen because it has demonstrated, in similar cases in Italy, the potential for improvements in system efficiency through active participation of users in system operation, maintenance and financing. Indeed, AVSI has worked to make available the rich Italian experience 'Irrigation Consortia' in participatory irrigation management to the Lebanese. The process of the creation of the 'Marjeyoun-Khiam Plain Water Users' Association' followed several steps: the existing legislation was analyzed, acquired water rights farmers from the Dirdara waters were identified, the statute of the association was prepared, the irrigation regulation was drafted and then adopted, and finally the WUA was registered in 2008 as an agricultural cooperative under the MoA like the three other WUAs analyzed previously.

This association, guided by AVSI, was able to forbid illegal wells and pumping from the pool by enforcing the application of the law. This was available with the strong cooperation of the municipalities (Khiam, Qleïa and Bourj el Moulouk), the political parties present in the region, the *Caimacam* (sub-governor) and the farmers. Moreover, a caretaker has been put in place to be responsible of the scheduling and distribution of water.

This WUA allowed people to return and cultivate their lands in an organized way after 30 years of chaotic situation. Antoine Hajj, an old farmer, remembers with delight the times when a whole family was able to survive thanks to agriculture. He believes that now the chances to revive agriculture in the 'Marj' are high again. What is wonderful also is that agriculture shifted from low-income seasonal crops (tomatoes, beans, cucumbers....) to highly remunerative perennial plants (apples, pecan nuts, plums, pears, peaches....) thanks to the availability of water through drip irrigation system even to the tail enders. Indeed, water was available by gravity 2 km farther into drip pipes. People can hardly believe what has happened in two years here: they all started to plant stone fruit seedlings. Milad Saïdy, a farmer and vice-president of the WUA, is so excited to be able

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<sup>41</sup> Marco Perini, personal communication

<sup>42</sup> Maya Aoun, personal communication

to cultivate his land again. He is also a school teacher and every morning before going to class he passes by his plot that is bringing him not only additional financial revenue but moral satisfaction also. This is the key of the success of this WUA: the strong willingness of the farmers to better manage the waters of Dirdara since they are now receiving the water they would not even dream of it in two years ago.

The creation of a WUA to manage the Dirdara waters has been crucial in the resuscitating of agricultural productivity in the Marjeyoun-Khiam plain. Undeniably, the strong willingness of participation demonstrated by the farmers is a key point in the success of this WUA.

#### **5.5.5. Others**

In July 2006 the Israeli bombings over Lebanon and especially in the south resulted in a lot of material damage and rural migration. Thanks to the many donation campaigns that followed, many other WUAs were created.

The WUA of Mchaytiyyeh has had a positive impact not only on its farmers and inhabitants but also on surrounding villages. Dr. Hanna Khoury proudly says that four neighboring villages have adopted the system he conceived: digging a well, collecting the water in a hill lake and distribute it through pressurized canalizations to the farmers. Indeed, the villages of Btedai, Bechouat, Barqa and Zarazir have already constructed the hill lakes and installed the network.

In Btedai, a Water Users' Cooperative has been created by the RDP of the Northern Beqaa. This legal status is a first in its kind in Lebanon and could be used as an example for other WUAs in the future. This cooperative profited from micro-credits in form of irrigation equipments. They immediately installed the collective irrigation scheme by its own means and with the financial contribution of local partners and the technical assistance and supervision of the RDP project.

In Baskinta, a WUA has also been created by the personal initiative of Elias Hajj who gathered the farmers (mainly stone fruits producers) that profit from the waters of Sannine springs.

#### **5.6. The impact of those WUAs on their environment**

After identifying and analyzing the different WUAs functioning in Lebanon, it is wise to evaluate the positive and negative aspects of the impact of those WUAs on their own environment and on the overall water management in Lebanon.

It may be obvious in almost all the cases that international donors or projects were behind the creation of the WUAs. Rarely the decision came from the farmers themselves, although most of them accepted gratefully the idea, and this affects in a way the self-governance and the autonomous management of the WUA after the end of the assistance support. Marco Perini, the director of AVSI in Lebanon, confided to me his apprehensions towards the continuation of the WUA of Marjeyoun after the end of AVSI supervision. Indeed, the assistance, support and money provided by internationally funded projects helped towards the success of WUAs as in the cases of Jabbouleh and Marjeyoun, but what if projects are not anymore conducted in Lebanon? And what if external money is not anymore provided?

Dr. Hanna Khoury is not afraid from this top-down issue because he believes that his fellow farmers were behind the creation of their WUA. This is true, but the key of this WUA's success does not reside in the fact that all the farmers of this small village belongs the same family (Khoury) and that they all related in a way? This fact has definitely played in favor for the good implementation of the WUA in Mchaytiyyeh. This case is quite similar in Jabbouleh where all the farmers are in fact tenants of the same landowner: the Catholic Diocese. It may be understandable now that the

plurality of farmers and owners on the Canal 900 has hindered in a way the good functioning of the 'Lake Share Communities Union'.

However, this is not the only cause there; farmers' individualism and unawareness in South Beqaa is as strong as dishonesty among LRA ditch riders that are usually non-farmers. Farmers cannot impose LRA to hire caretakers among them, and thus they do not have other choice than accepting the facts. Indeed, political influences are playing here a bad trick to the farmers. In Marjeyoun however, political intervention has helped the WUA to impose the rules and laws in the region and forbid illegal exploitation of the water resources.

This enforcement of the law in Marjeyoun has allowed water to reach all the plots of the plain. The strong willingness of the farmers has definitely played a role also in this issue and now they are rewarded by being able to plant fruit trees in their lands. The farmers of Mchaytiyyeh can share this feeling with the farmers of Marjeyoun because they have been able also to reclaim lands from the hills and plant them with fruit trees, competing even with their rich neighbors of Ainata and Oyoum Orghosh. The successful example of Mchaytiyyeh has been appreciated by neighboring villages that have adopted the same irrigation system.

Fortunately in Lebanon, at least when a project succeeds, other regions want to copy it. This has also been the case of the AcquaCard system of Jabbouleh that the LRA and UNDP want to implement on the Canal 900 and later on the projected Canal 800. Indeed, the AcquaCard system has been a clear success in Jabbouleh because it has been able to regulate water flows, reduce human intervention, triple the production and economize water up to 60 %.

### **5.7. Reflection on WUAs in Lebanon**

This chapter was important because it in fact represents the core of my research. I explained and analyzed what I really researched in the field: the functioning of the WUAs in Lebanon and their impact on water resources management and on rural and agricultural development. I first started by analyzing the legislations in vigor for the creation of a WUA in Lebanon because it is the most important issue when we talk about legal basis that makes a WUA formal. Then I explained that the complexities found did not stop many initiators (local and international partners) to find other legal ways to create WUAs. Unfortunately, the legal basis is not the only problem towards the creation of a WUA in Lebanon but the farmer's behavior and the political and administrative settings play a major role in this issue also. Then, before identifying the existing WUAs, I explained the potential roles future WUAs could play in the different schemes in Lebanon. This is very important to know before implementing a WUA somewhere in order to understand the ultimate goal of its creation.

Four important and other starting WUAs have been identified in Lebanon. It is true that we are still in the embryonic process of implementing WUAs in the irrigation schemes of Lebanon as Dr. Selim Catafago explained but the closer analysis of those WUAs has shown some positive points we should remember. Indeed, out of the four WUAs analyzed, three were considered to be functioning well and having had a positive impact on the water management process. Thanks to the many reasons I elaborated in the previous sections, those WUAs do indeed constitute the embryo of what could be in the future WUAs' Consortia that will manage all the irrigation schemes of Lebanon.

This process of transferring power and management to the farmers associations is a necessary and important component of strengthening IWRM in Lebanon. The process has started but until now its evolution is still sluggish and the impacts are very hard to be seen. But as 'many a mickle makes a muckle', if we do not start now by implementing more and more WUAs, the power transferring process and ultimately the IWRM implementation would take ages.



## Chapter 6: Conclusion, Reflection and Recommendations

Almost a decade after the end of the civil war that inflicted large damages to the country, the government of Lebanon started to take ameliorative statutory measures and has launched in 1999-2000 its water sector reform by adopting a water master plan and promulgating a series of laws and decrees. In 2009, due to many financial and political obstacles, the results achieved by those reforms were not as expected: only one dam out of the 17 planned was completed, the new regional WEs have not yet taken total control over the old AWOs and LCs and the Water Code has not yet been promulgated by the parliament. This has led many international and local water experts to think about new ideas in order to fully implement IWRM in Lebanon. Everyone agrees that IWRM is the goal to reach and that reforms are the way to do it: in Lebanon, implementing WUAs in irrigation schemes is one of the most crucial reforms to adopt for strengthening IWRM.

In order to do that, a holistic understanding of the historical and current Lebanese water and agricultural settings was necessary before studying and analyzing the implementation of WUAs and their impact on the overall water management in Lebanon. This concluding chapter is mainly a summary of the findings and answers of the MRQ. The first section answers the first part of the MRQ related to the current water management practices in Lebanon. The second section answers the second part of the MRQ related to the impact of the implementation of WUAs on the strengthening of IWRM in Lebanon. The third section reviews the content and concepts used in this research and reflect on them. The last section presents recommendations and opportunities for the future.

### 6.1. Current water management practices in Lebanon

Water management in Lebanon has been closely related to the historical events that shaped the Lebanese identity since antiquity. At every stage of its history, water management witnessed the different periods Lebanon passed through. Moreover, not only the foreign occupations influenced the agricultural water uses and practices but also the traditions, customs and habits inherited from the past and transmitted through generations.

The Lebanese were blessed to receive a considerable amount of rain water compared with their neighbors; that is why since the 17<sup>th</sup> century peoples, families and villages understood the importance of water and established a peaceful mutual agreement to manage and utilize water in a useful way to everyone. From this time, the principle *Water is a public good that should be protected and conserved* constituted the basis of all the legislation that governed the water sector in Lebanon. The first jurisdictions were in fact unwritten and were only a certain number of rules responding to the common sense of people recognized with time as customs and habits. They remained unwritten until the Ottomans started to codify them along with the Sharia and the Napoleonic Code under what has become known as the Majallah Code in 1877. Lebanese water legislation has indeed been largely governed until the year 2000 by the Ottoman Majallah Code.

On the other hand, irrigation has been regulated by the Ottomans as well when they published the Irrigation Code in 1913. When the French arrived in 1920 they also had a positive influence on water management practices because the two fundamental texts governing the water sector in Lebanon have been written during their mandate. After its independence in 1943, Lebanon entered a glorious period for water management with the creation of the MEW and the LRA and the construction of the Qaraoun dam on the Litani River. Unfortunately the war that extended from 1975 to 1990 prevented many texts to be promulgated and wreaked chaos and damages on the overall hydraulic infrastructure. Fortunately, the post-war period was blessed with many international help and assistance that allowed the rehabilitation of the main irrigation schemes of the

country. Moreover, water sector reforms have been launched in 2000 to push the country forward towards IWRM implementation.

Today, the current water management framework is based on the involvement of several different actors. The main two responsible of water management in Lebanon are in fact two governmental bodies, the MEW and the WEs. They are responsible of formulating a general water policy for the country, executing projects, providing water services and applying the law. The other actors include the LRA, ministries, universities and research center, NGOs, WUAs and farmers. All together they are involved in the overall management of the water sector. However, none of them is alone affectively managing the water. Indeed, WEs in Lebanon do not function like River Basin Agencies (RBA) and thus they are far from actually managing water, pollution, budget and laws. They only provide services to the consumer (potable, irrigation and wastewater).

The case was worse in the past when 22 AWOs and 209 LCs were involved regionally to manage the water. This occurred due to the absence of the government especially during the war. Although many experts already called since 1972 to reduce those offices into four main WEs, it was not until 2000 that the law related to this was promulgated: unfortunately, the application decrees were only issued in 2005. Those four new WEs in addition to the LRA are now directly responsible for water management in their regions. The merging of the old offices into four regional WEs was definitely a good idea because it considerably reduces the administrative paper work and financial waste and it allows for the creation of technical departments with qualified engineers.

Understanding the current water management framework in Lebanon is important before tackling the issue of implementing WUAs. However, an analysis of the actual agricultural water uses is also crucial to understand the habits and practices of the Lebanese farmers. Without having this clear picture in our mind, we cannot perfectly tackle the issue of WUAs in Lebanon.

Thanks to its diverse geographical topography, and thanks to the abundance of precipitations (rain and snow), Lebanon offers a multitude of opportunities for the farmers to utilize the water. In the past, and before the construction of modern irrigation schemes, mountainous farmers used to get water from the abundant springs. They have acquired rights on water and they still hold them. In every village of the Lebanese mountain there used to be a caretaker responsible for the allocation of water to the farmers depending on rounds and times.

After 1968, modern irrigation networks started to be installed and farmers situated in these schemes (usually areas poor in springs) were blessed to receive water. However the damages caused by the war pushed many farmers situated in springs-free areas (Beqaa and the coast) to dig private wells which have had a negative impact on the groundwater levels and quality. Hill lakes have been a successful alternative to the lack of water in highly mountainous areas. The MEW understood this issue and included in its master plan the construction of many hill lakes. These reservoirs could work as an alternative to the overexploitation of groundwater.

The current water management framework in Lebanon has been described and the complete puzzle of agricultural water management uses and practices has also been depicted. The minds are clear now to tackle the issue of implementing WUAs and analyze their impact on the strengthening of IWRM in Lebanon.

## **6.2. Are WUAs strengthening the implementation of IWRM in Lebanon?**

Implementation of WUAs in Lebanon has never been seriously on the agenda of the Lebanese government probably because of the marginalization of the agricultural sector since independence. Indeed, the only available text concerning the creation of WUAs dates back to 1926. Not only is



this text legislatively complex but only one WUA has been created under it and unfortunately its actions do not seem to have affected its environment.

The complexity of this text has restrained many to create WUAs and has encouraged others to rewrite an updated draft proposal to make new legislation available that the farmers will use. Unfortunately the proposed reform of the text written by Hyam Mallat in 2006 has never been promulgated by the parliament making the task even more difficult to the different initiators (local and international partners) that want to implement WUAs in the irrigation schemes of Lebanon. The farmers and water users are regrettably paying the price of the nonchalance of the politicians.

Fortunately, the juridical lack has not restrained several projects to be launched with the aim of implementing WUAs. The Italian Cooperation, USAID and the EU were the main financial backers behind the creation of four main functioning WUAs (Mchyatiyyeh in 1997, South Beqaa in 2003, Jabbouleh in 2004 and Marjeyoun in 2008) as well as other minor ones. All those WUAs are in fact masked behind agricultural cooperatives due to the legal handicap of WUAs in Lebanon.

Moreover, before analyzing the impact of the WUAs mentioned above on their environment, it was wise to explain some other obstacles towards the establishment of WUAs. The individualistic behavior of the farmers as well as the political, administrative and social settings of the Lebanese state may have a negative effect and slow down the process of implementing WUAs. However, when raising awareness campaigns will be conducted, the farmers will understand the ultimate goals of creating WUAs and will positively respond to their establishment. Indeed, the long term role of WUAs is the takeover of the management, operation and maintenance of the whole scheme when WUAs consortia will be created after acquiring experience and knowledge. But before that, the way is long and focus should be done on existing WUAs and on the projected creation of new ones.

Analyzing the functioning and the impact of the WUAs on their environment will bring the clear answer to whether WUAs are indeed strengthening the implementation of IWRM in Lebanon. We should be careful that there are degrees of strengthening and that we should give attention to the effective influence of WUAs on the overall water management in Lebanon.

We have seen how the creation of a WUA in Mchaytiyyeh has impacted positively the region. The existence of this WUA has made water available to the village and agriculture is flourishing once again. Moreover, this WUA has profited from its legal status of agricultural cooperative to provide other services to the farmers such as common tractor, cooperative fridge, common fertilizers and marketing. Undeniably, this WUA has activated a developmental process in this region that resulted in the return of many farmers that had emigrated from the village.

In Jabbouleh, the installation of a modern irrigation network and distribution system (AcquaCard) and the implementation of a WUA on the scheme have also resulted in many positive impacts. Indeed this has helped first regulating the permanent availability of water even during dry period, allowing the production of horticultural crops that requires more water, tripling the production, practicing night irrigation and reducing human interventions. On fruit trees, water was economized by 50 %: 4,000 m<sup>3</sup> of water would be saved by 1 ha which means that 10,000 would save 40 millions of cubic meters of water (the capacity of the projected Orontes dam). On cereals, water was economized by 60 %: 2,500 m<sup>3</sup> of water would be saved by 1 ha which means that 40,000 would save 100 millions of cubic meters of water (half the capacity of the Qaraoun Dam). This shows the importance of the impact of this WUA on the overall water management in Lebanon.

In Marjeyoun also, the rehabilitation of the irrigation scheme and the creation of a WUA have had a strong impact on the farmers who started again to cultivate their lands after 30 years of fallow. Indeed, not only this WUA has allowed water to reach again tail ender farmers but it permitted them even to shift from low income crops to high rewarded productions such as fruit trees. The 'Marj'

was always considered the living heart of the Marjeyoun district; today, this area will again participate in the rural development of the whole region.

Unfortunately, the WUA in the South Beqaa irrigation scheme does not seem to have affected yet positively the region. Nevertheless more time should be allowed for the farmers to learn about the benefits of being gathered into WUAs. This does not mean that this WUA is hindering the overall process of strengthening IWRM because we can still learn from the mistakes and know how to overcome them in other cases.

Finally, it is true that the existing WUAs have had a strong impact in their regions but a minimal one on the scale of Lebanon. We should however continue to encourage the creation of WUAs and provide them assistance because if we do not start on time, we will not be able to reach the goal everyone has put in mind: implementing IWRM in Lebanon. Practical steps should be taken immediately starting with the promulgation of the new updated law on WUA and later on with the creation of a national authority for irrigation that will supervise the establishment of the WUAs throughout Lebanon.

### 6.3. General Reflection on the content and concepts

This research has been executed following a conceptual framework that has been elaborated at the beginning around certain specific concepts. It acted like a map that gave coherence to my research and it guided the logical and systematical development of the problem solving. When I reached the end of my work, I was able, thanks to the findings, to elaborate practical conclusions that answered my questions. Two main topics were tackled to reach the same goal of **IWRM: agricultural water management** and governmental **reforms**.

The framework used is first depicted below and then a conceptual reflection is given whether the presented concepts provide a genuine roadmap to analyze the water reforms processes.

The water issue in Lebanon is a very important subject that is in every one's mind although governments have always marginalized the development of this sector. In Lebanon everything is related to water: from agriculture to industry, from household to leisure. Moreover water has shaped the history of Lebanon, while historical events have shaped water management practices as strongly. I have been living for 21 years in this country but it is not until I conducted research on water management that I understood how the Lebanese society has been closely related to the availability of water. Indeed, since pre-historical times, peoples inhabited water-rich areas of this territory and this has remained until today where villages can only be bound next to water sources.

Looking back at the concepts I used to research **agricultural water management**, I have been amazed by the capabilities of the Lebanese farmers to **control the water** they have. They have been able since antiquity to take power over this crucial resource and utilize it in an optimal way. They constructed canalizations in difficult mountainous regions in order to bring water to the orchards. Moreover, their methods of **governance** have been acknowledged since the 17<sup>th</sup> century by many western visitors such as Volney or Lamartine. They have been surprised by the competences and aptitudes of the Lebanese farmers to find a peaceful agreement to manage water in a useful way for everyone. It is the **participation of all the stakeholders** (villages, families, farmers) together for the mutual organization of water allocation that made from Lebanon a prosperous land until the start of the several wars that destroyed the country not only materially but socially also.

Today, we can only bet on the historical mutual manners that transformed the mountain into hanging gardens rich in agricultural products to facilitate the implementation of WUAs in irrigation schemes. It is definitely sure that the presence of such association to organize the management and distribution of water will influence positively the process of IWRM application in Lebanon.

However, this could not be possible without the strong intervention of the government to implement **reforms** that will open the way first to the legal establishment of WUAs and later to the prorogation of other reforms related to the strengthening of IWRM in Lebanon. For that, the **institutional pluralism** in Lebanon does not always make the task easy. The presence of 17 different religious communities having each its own laws, beliefs and customs played a role in the sectarian influences related to implementation of reforms. Moreover, the superposition of custom laws, Ottoman laws, French laws, international laws and finally Lebanese laws are in a way enriching the Lebanese legislation but in another way complicating every process of statutory reforms.

Finally, I have been able to see throughout my research the extended impact of **political dynamics** on water resources management. Indeed, Lebanon has been always pressured by outside parties to conduct internal reforms. The number of internationally funded developmental projects related to water resources management and reforms indicates the strong influence of the donors on Lebanon.

The reason to divide the concepts in two groups is not only because the MRQ is constituted of two questions but also to show that for reaching the ‘goal’ that is IWRM, several ‘ways’ are possible and fundamentals in order to reach it: **the statutory reforms** and **the agricultural water management**.

Concerning the reforms, the utilization of two political related concepts is not the fruit of the hazard. This approach is grounded in the notion that water resources management is politically contested (Mollinga, 2001) and that institutional transformation is inherently political (Merrey, et al., 2007). That is why in order for me to understand the mechanism behind reform adoption and implementation, a political angle of view was necessary. Using the two concepts of political dynamics and legal pluralism helped me a lot knowing that reforms are successful when ‘windows of opportunities are used’ and political goodwill is available.

On the other side, concerning agricultural water management, the combination of governance, stakeholder’s participation and water control was primarily intended to cover the practices and agricultural water uses of the Lebanese farmers. By doing that, a good understanding of the behaviors was done and an interesting consideration was provided concerning the functioning of WUAs and the strengthening of IWRM. The depiction of the farmer’s historical and current behavior through the use of the water control and governance concepts and the understanding of the functioning of the existing WUAs through the use of the participation concept explain the importance and the relevance of the utilization of those concepts in this research thesis.

#### **6.4. Recommendations and Opportunities for the future**

Considering the outcomes of my research and what has been observed in the field during three months of stay in Lebanon, some recommendations and propositions for improvement in the future can be given:

- On the national level, the government should be spending more time on planning on how to manage water and other issues rather than managing political crises and losing time waiting for terms and deadlines.
- The government should immediately initiate the process of administrative decentralization, as desired lately by the president of the Republic, to favor the enforcement of local governments and local water management bodies in order to better manage water resources without returning each time to the central ministry. Part of the decentralization process would include the strengthening of the participation of the citizen in the decision-making:  
*Engaged Citizen*

- On the ministerial level, the MEW should, before drafting plans and strategies, establish a key vision for the water sector in Lebanon and then write the main water policy for the coming years. IWRM should constitute the main goal and thus should be focused on more by adopting the water strategic paper and the projected IWRM National Plan.
- WEs that are presently only providing services to the consumer should be effectively managing water. They should be transformed into *Agence de bassin* and management of irrigation water should be separated from potable and wastewater. A National Irrigation Authority (NIA) should be created then to concord the tasks of the MEW and MoA in order to better manage the irrigation sector.
- The concepts of IMT and PIM should be strengthened to open the way for a good implementation of IWRM. For this, WUAs implementation should be largely backed by the MEW who should first start by promulgating the updated decree proposal. Raising awareness campaigns and capacity building formation should be initiated to help the WUAs function well and let them one day be gathered into consortia managing all the irrigation schemes of Lebanon.

After the 2<sup>nd</sup> Water Week held in Beirut in February 2009, the MEW has decided to postpone the deadline of the Water Master Plan from 2009 to 2018 which leave for the country enough time to fulfill the technical part of IWRM. On the other hand, in order then to complete the implementation of IWRM in Lebanon and adopt the socio-economical part, a National IWRM Plan was decided to be drafted in cooperation with European and Mediterranean partners. This opens the way to more research on this issue in Lebanon and as J. A. Allan expects 25 years to see reform changes, it could be interesting to see what will in fact be the state of the water sector in Lebanon in 2025.

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## **Annexes**

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## **Annex 1: List of Locations visited in Lebanon:**

### **▪ Institutions**

- Ministry of Energy and Water (MEW) - Beirut
- Litani River Authority (LRA) – Beirut, Bir Hassan and Khirbet Kanafar
- Chamber of Commerce, Industry and Agriculture of Zahleh and the Beqaa (CCIAZB) - Zahleh
- Lebanese Agricultural Research Institute (LARI) – Tel Amara
- American University of Beirut (AUB) – Beirut

### **▪ Organizations**

- Economic and Social Commission for Western Asia (ESCWA) – Beirut
- United Nations Development Program (UNDP) – Chtaura
- Food and Agriculture Organization (FAO) – Baabda
- Association of Volunteers in International Service (AVSI) – Jounieh
- German association for Technical Cooperation (GTZ) – Baabda
- An-Nahar newspaper – Beirut
- L'Orient le Jour newspaper – Beirut
- The Daily Star newspaper – Beirut

### **▪ Irrigation schemes**

- Akkar Plain irrigation scheme
- Nahr el Bared dam and scheme
- Yammounneh irrigation scheme
- Chabrouh dam
- Kfardebian and Faraya irrigation scheme
- Daychouniyyeh dam and irrigation scheme
- Qasmieh –Ras el Ain irrigation scheme
- Ras el Ain reservoirs
- Oyoun Ourghosh lakes and scheme
- Anjar irrigation scheme

- Marjeyoun-Khiam plain irrigation scheme
- South Beqaa irrigation scheme
- Saghbine (Ain Shouaa) irrigation scheme
- Khrayzat irrigation scheme
- Laboueh irrigation scheme

▪ **Water users' Associations (WUAs)**

- Mchaytiyyeh
- Lake Share Communities Union
- Jabbouleh
- Marjeyoun
- Baskinta



## **Annex 2: List of people contacted and/or interviewed between 10/10/2008 and 20/1/2009**

**Dr. Ali Abboud:** Chairman of LRA – *interviewed on 19/1*

**Maya Aoun:** AVSI engineer – contacted twice on 2/12 and 22/12

**Mrs Imane Ibrahim Abdel Aal Arab:** Daughter of Ibrahim Abdel Aal and Responsible of the Association of the friends of Ibrahim Abdel Aal – *contacted on 12/11*

**Raghd Assi:** Energy and Environment advisor for agriculture at UNDP – *contacted on 5/11*

**Dr. Maher Bou Jaoudé:** AVSI engineer – *interviewed on 10/11*

**Dr. Selim Catafago:** President of LRA, former consultant of MEW – *interviewed on 13/1*

**Georges Chahine:** AVSI officer – *interviewed on 5/12*

**Nabil Chemaly:** GTZ officer – *interviewed on 22/12*

**Maher Chrabieh:** Head of the AWO of Dbayeh - *contacted on 15/12*

**Dr. Fadi Comair:** General Director of Hydraulic and Electric Resources at the MEW - *interviewed more than 5 times*

**HE Dr. Adel Cortas:** Former Minister of Agriculture and FAO consultant – *interviewed twice on 16/1 and 19/1*

**Dr. Nadim Farajallah:** Associate Professor of Environmental Engineering at AUB - *interviewed more than 5 times*

**Saïd Gedeon:** Head of the Farm Management & Accounting Center at CCIAZB – *interviewed twice on 20/11 and 25/11*

**HE Me. Robert Ghanem:** Parliament Member representing South Beqaa district – *interviewed on 29/11*

**Ghassan Haddad:** Msc in Irrigation, worked on a project of the UNCCD on water resources projects inventory in Lebanon – *contacted on 9/11*

**Nicolas Haddad:** Agricultural Education and Research Center (AREC) manager – *interviewed on 25/11*

**Me. Nagib Hage Chahine:** Lawyer – *interviewed on 24/11*

**Elias Hajj:** President of WUA of Baskinta – *contacted on 14/1*

**Hussam Hawa:** Author of a thesis on water resources in Lebanon – *interviewed on 9/11*

**Dr. Bassam Jaber:** Former General Director of Hydraulic and Electric Resources at the MEW – *interviewed twice on 23/12 and 9/1*

**Georges Kadi:** Head of Projects Department at Beirut and Mount Lebanon WE – *contacted on 17/12*

**Wissam Kanj:** Irrigation engineer at MEW – *contacted on 13/1*

**Dr. Kamal Karaa:** Head of Rural Development Department at LRA – *interviewed twice on 6/11 and 27/11*

**Dr. Fadi Karam:** Head of Irrigation Department at LARI – *interviewed on 12/1*

**Dr. Hanna Khoury:** President of the WUA of Mchaytiyyeh – *interviewed on 20/11*

**Emmanuelle Kunigk:** Author of a thesis on water policy in Lebanon – *communicated several times by email and interviewed on 18/12*

**Milad Mallah:** Irrigation engineer at MEW – *contacted on 4/12*

**Me. Hyam Mallat:** Lawyer, professor of water legislation, author of many water-related articles and books - *interviewed on 3/12*

**Dr. Youssef el Mouji:** ESCWA consultant - *contacted on 12/12*

**Marco Perini:** President of AVSI in Lebanon – *interviewed on 19/1*

**Tarek Sadek:** Water and Environment officer at ESCWA – *interviewed on 19/1*

**Salah Saliba:** UNDP officer – *contacted on 5/11 and interviewed on 10/11*

**Soledad Silva:** FAO librarian – *contacted on 7/11*

**Francis Stephane:** AFD officer in Beirut – *contacted on 25/10*

**Nazir Torbey:** Responsible of the ‘Lake share communities union’ – *interviewed on 10/11*

**Rita Wakim:** Research Assistant at AUB – *Contacted on 21/10*

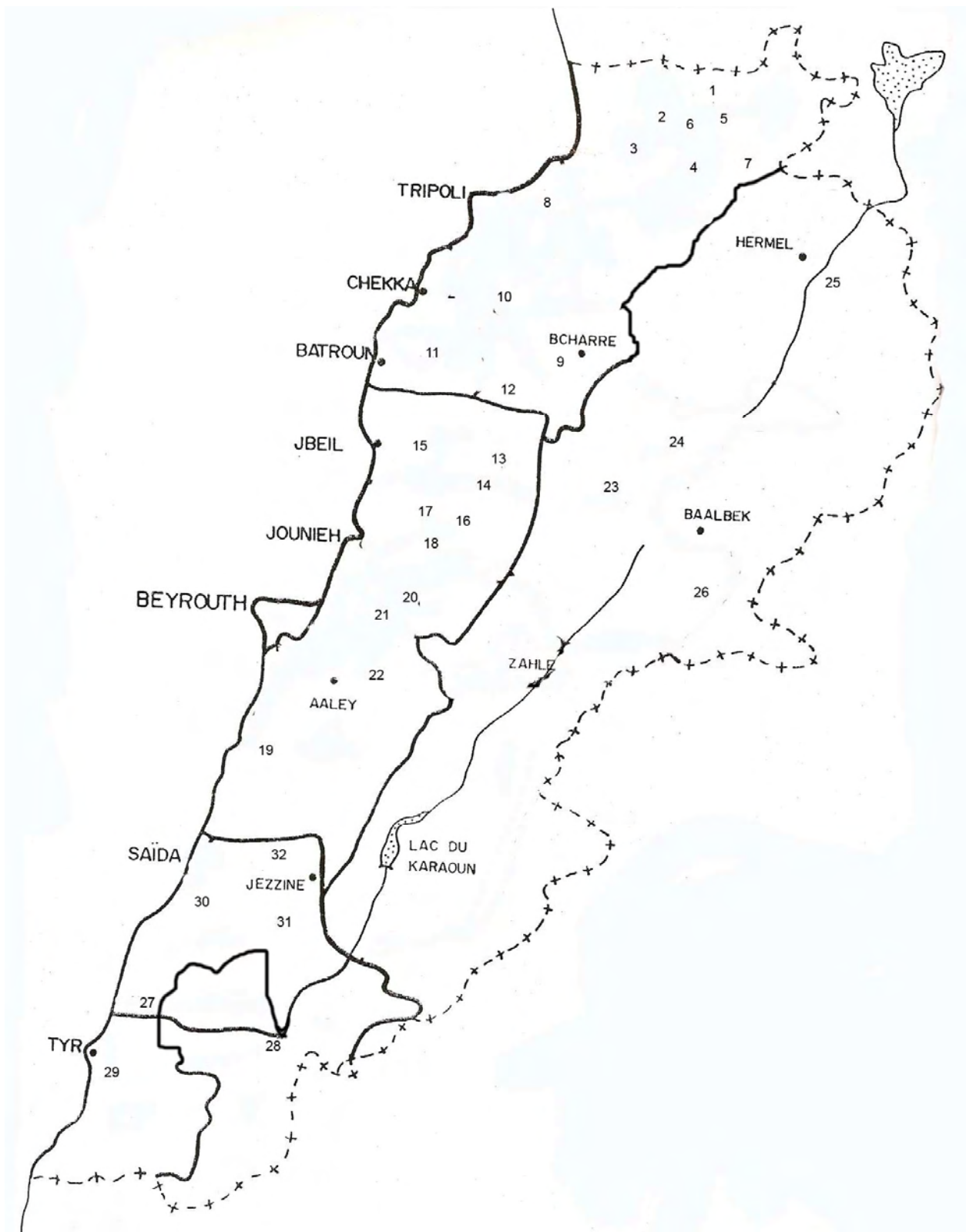
**Andre Zoueïn:** AVSI officer – *contacted on 22/12*

In addition to the farmers: **Jean Khoury, Milad Saïdi, Saadeddine Jardali, Antoine hajj, Hussein Abdallah**, and many others that I unfortunately miss the names.

Annex 3: List and map of the dams and lakes planned by the Water Master Plan (MEW)

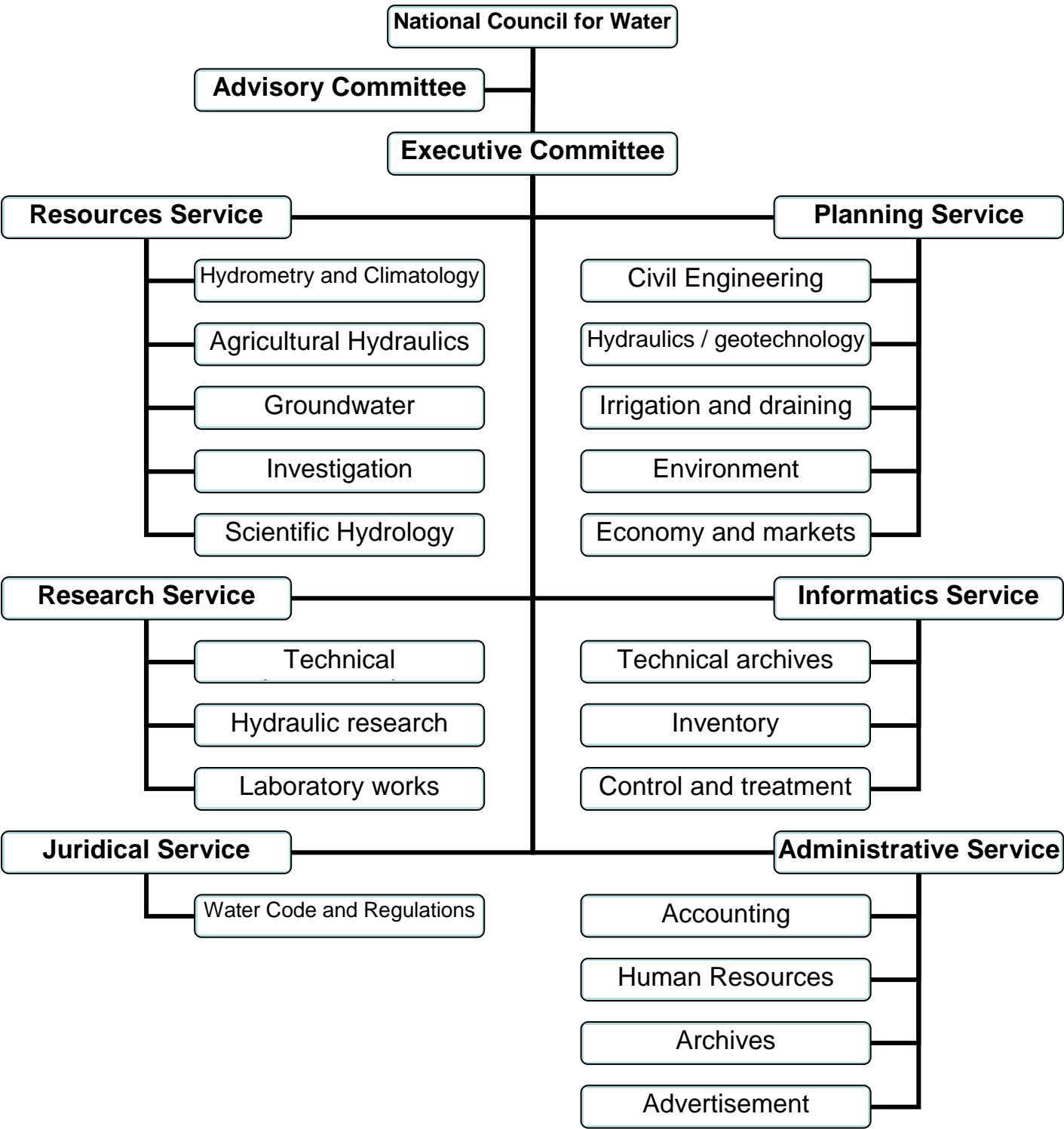
***The 10 years water plan projects***

<b><i>Mohafazat of the North</i></b>			
<b>Dam</b>	<b>Destination</b>	<b>Capacity (millions of m3)</b>	
Noura Tahta sur le Nahr Kébir	Irrigation	60	1
Korkof sur le Wadi Jamous	Irrigation	30	2
Bared du le Bared	Eau potable	35	3
Qammouaa	Irrigation & tourism	1	4
Aidamoun	Irrigation	0.3	5
Kawachra	Irrigation	0.35	6
Brissa	Potable water & irrigation	0.9	7
Iaal	Potable water & irrigation	10	8
Becharré	Potable water & irrigation		9
Dar Beachtar	Potable water & irrigation	55	10
Kfifan	Eau potable	1.5	11
Tannourine	Potable water & irrigation		12
<b><i>Mohafazat of Mont-Liban</i></b>			
<b>Dam</b>	<b>Destination</b>	<b>Capacity (millions of m3)</b>	
Aakoura-Mejdel	Potable water & irrigation	2	13
Afka	Potable water & irrigation	2.5	14
Jannah	Potable water & irrigation	30	15
Chabrouh	Eau potable	11	16
Mayrouba	Potable water & irrigation	18	17
Baqaata	Eau potable	6.5	18
Damour	Potable water & irrigation	40	19
<b>Lac collinaires</b>	<b>Destination</b>	<b>Capacity (millions of m3)</b>	
Habash-Zaaroru	Eau potable	0.55	20
Qsaymani	Eau potable	0.55	21
Aazounieh	Potable water & irrigation	8	22
<b><i>Mohafazat of Bekaa</i></b>			
<b>Dam</b>	<b>Destination</b>	<b>Capacity (millions of m3)</b>	
Yammouné	Irrigation	1.2	23
Younine	Irrigation	25	24
Oronte	Potable water & irrigation	25	25
Massa	Irrigation	8	26
<b><i>Mohafazat of the South</i></b>			
<b>Dam</b>	<b>Destination</b>	<b>Capacity (millions of m3)</b>	
Kfarsir	Potable water & irrigation	8	27
Khardalé	Irrigation	120	28
<b>Lakes</b>	<b>Destination</b>	<b>Capacity (millions of m3)</b>	
Aazbieh	Eau potable	0.6	29
Labaa-Jensnaya	Eau potable	0.8	30
Widening : Lake Kfarhoua	Eau potable	101	31
<b><i>Grand-Beirut</i></b>			
<b>Dam</b>	<b>Destination</b>	<b>Capacity (millions of m3)</b>	
Bisri	Potable water & irrigation	120	32





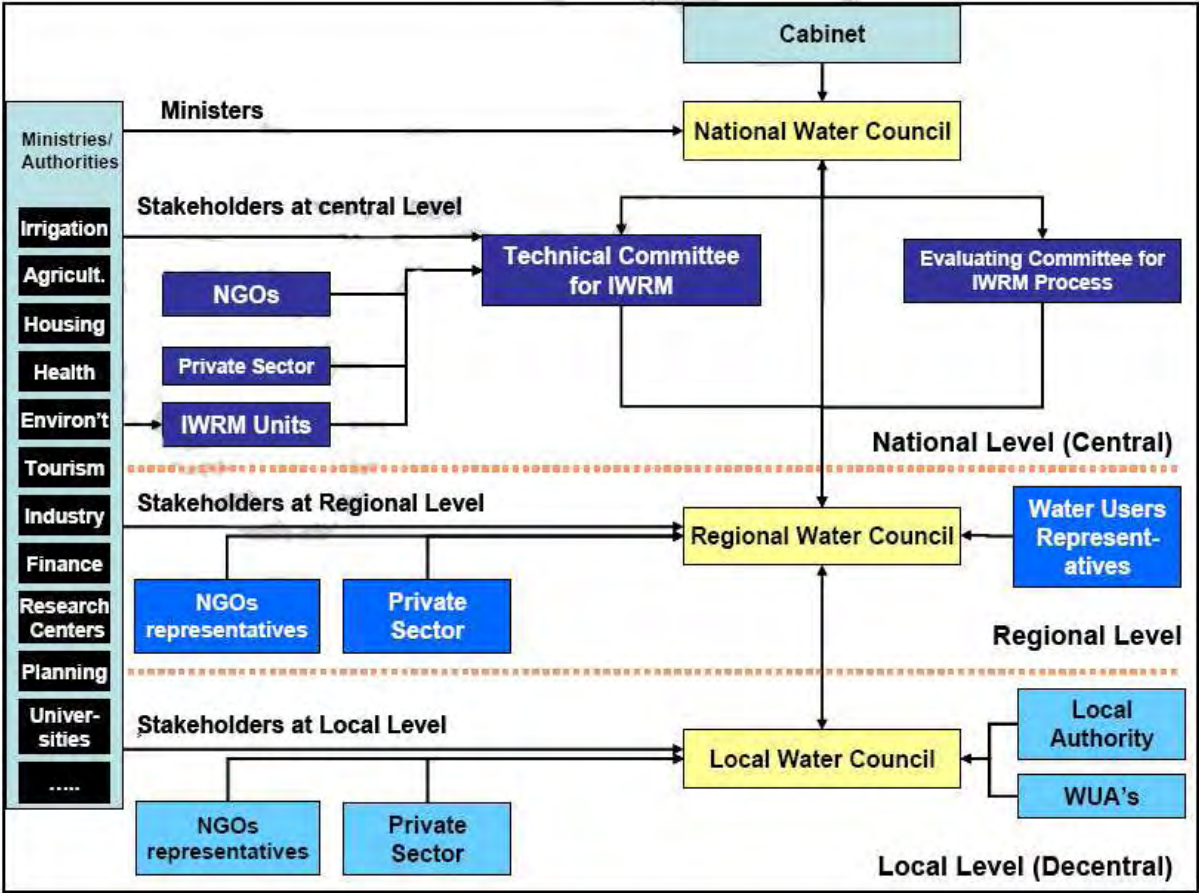
**Annex 4: Proposed organizational chart of the National Council for Water (NCW)**  
(Majdalani, 1991)







**Annex 5: Proposed Institutional Structure for implementation of IWRM plans at the national level in the ESCWA countries (ESCWA, 2007)**





## Annex 6: Water Strategic Paper – Matrix concerning the sector reform study of water and wastewater (Comair, 2008)

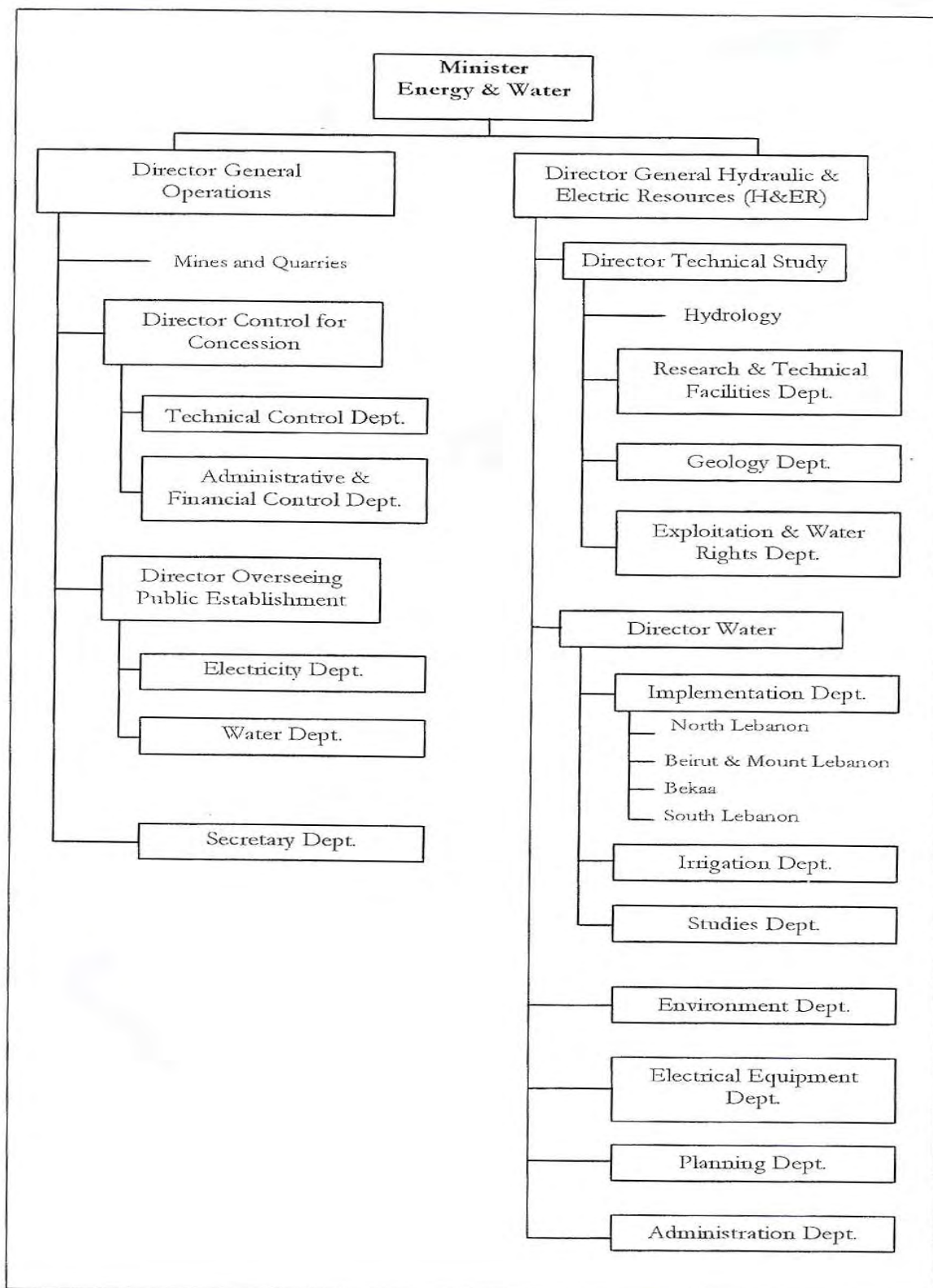
IWRM Sector Reform Strategy

Sector Reform Objectives	Completed Actions	Actions to be completed by June 30, 2007	Actions to be completed by December 31, 2007	Actions to be completed by December 31, 2008	Reform Outcome – by December 2008	Principal Responsibility
<b>Integrated Water Sector Strategy &amp; Policy.</b>	<ul style="list-style-type: none"> <li>- CDR Development Programme 2006 – 2009.</li> <li>- EU Neighbourhood Policy.</li> <li>- Privatisation study « Société Générale », Rafik ElKhoury.</li> <li>- Report on Water Sector Policy and Action Plan, IPP Water.</li> <li>- Agriculture Sector Strategy (FAO/World Bank).</li> <li>- World Bank Water Sector Note.</li> <li>- World Bank Irrigation Sector Note.</li> </ul>	<ul style="list-style-type: none"> <li>- Cabinet approval of “Water Code”.</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of the national water sector strategy and a Water Master Plan that would take into account: availability of water resources (irrigation, domestic &amp; industrial) and Institutional, regulatory, financial &amp; environmental aspects.</li> <li>- Public Expenditure Review of the water sector.</li> <li>- Benchmarking study &amp; performance indicators (Unaccounted for Water, Cost recovery, collection rate, etc.).</li> <li>- Complete a study of modernization of Irrigation with MOA.</li> <li>- Complete a survey of users' satisfaction.</li> </ul>	<ul style="list-style-type: none"> <li>- Government's approval of Integrated Water Sector Strategy &amp; Policy.</li> </ul>	<ul style="list-style-type: none"> <li>- National Water Master Plan.</li> <li>- “Water Code”.</li> </ul>	<ul style="list-style-type: none"> <li>- MOEW in association with CDR/RWA/ MOA/ MOEnv. / Donors.</li> </ul>
<b>Improve Sector Governance.</b>	<ul style="list-style-type: none"> <li>- Law 221 and its amendments.</li> <li>- Decrees (By-Laws) October 2005.</li> <li>- Appointment of Boards and DGs for all the Water establishments.</li> </ul>	<ul style="list-style-type: none"> <li>- Finalize model organization under Law 221 for MOEW.</li> <li>- Reactivate the National Water Council.</li> </ul>	<ul style="list-style-type: none"> <li>- Cabinet decision to allow:               <ul style="list-style-type: none"> <li>* RWAs to recruit qualified staff.</li> <li>* Procure Works, Goods &amp; Services with appropriate thresholds.</li> <li>* Management contracts with private operators.</li> </ul> </li> <li>- Establish mechanisms for tariff adjustments and service standards.</li> <li>- Establish a review process to define the roles of each stakeholder.</li> <li>- Initiate the process of handing over the O&amp;M of small/medium irrigation schemes to Water Users'.</li> </ul>	<ul style="list-style-type: none"> <li>- Adopt mechanisms for tariff adjustments and service standards.</li> <li>- Complete the process of handing over the O&amp;M of small/medium irrigation schemes to Water Users' Associations.</li> <li>- Finalize MOEW organization under Law 221.</li> <li>- Update RWAs Business Plans.</li> <li>- Study &amp; draft water sector regulatory framework.</li> </ul>	<ul style="list-style-type: none"> <li>- Finalized regulatory Framework.</li> <li>- New organization of the MOEW set up.</li> <li>- Clear definition of roles &amp; responsibilities of the various actors.</li> <li>- Establishment of Water Users Associations for irrigation.</li> <li>- Clear policy on cost recovery and subsidies for sector.</li> </ul>	<ul style="list-style-type: none"> <li>- MOEW in association with CDR/ RWAs/Donors.</li> </ul>



Sector Reform Objectives	Completed Actions	Actions to be completed by June 30, 2007	Actions to be completed by December 31, 2007	Actions to be completed by December 31, 2008	Reform Outcome – by December 2008	Principal Responsibility
			Associations.			
<b>Capacity Building.</b>	Law 221 and its amendments.	<ul style="list-style-type: none"> <li>- Finalize training program for the RWAs staff with KfW, EU &amp; WBI.</li> <li>- Prepare a detailed plan aimed at reinforcing MOEW, RWAs and LRA staffing &amp; logistics.</li> </ul>	<ul style="list-style-type: none"> <li>- MOEW and RWAs to set measures to optimise O&amp;M of water and wastewater facilities.</li> <li>- Bylaws of Law 221 fully implemented by RWAs.</li> <li>- Complete MIS in all RWAs.</li> <li>- Install an integrated financial &amp; accounting system in RWAs.</li> </ul>	<ul style="list-style-type: none"> <li>- Recruitment of qualified staff in MOEW, RWAs and LRA.</li> </ul>	<ul style="list-style-type: none"> <li>- Completion of water establishments staffing plans, management and equipment tools.</li> </ul>	Government, MOEW & RWAs /LRA.
<b>PPP &amp; Private Sector Participation.</b>	<ul style="list-style-type: none"> <li>- Tripoli Water Authority Management contract.</li> <li>- Baalbeck-Nabi Chit Service Contract (O&amp;M).</li> <li>- O&amp;M contracts for wastewater treatment plants under construction.</li> <li>- LWPP.</li> <li>- Consultant appointed to study PPP options for North Lebanon.</li> </ul>	<ul style="list-style-type: none"> <li>- Assess Tripoli management contract by independent party.</li> <li>- Study PSP possibilities in Irrigation with Litani River Authority (LRA).</li> </ul>	<ul style="list-style-type: none"> <li>- Prepare a regulatory framework which includes dispute resolution.</li> <li>- Appoint a consultant to MOEW, CDR and RWAs to develop model Tender and Contract Documents for service, Management Contracts (with WB assistance) and Model Contracts for Regulation (GTZ).</li> </ul>	<ul style="list-style-type: none"> <li>- Set up of a regulatory body for the water sector.</li> <li>- Establish a regulatory framework which includes dispute resolution.</li> </ul>	<ul style="list-style-type: none"> <li>- Model Tenders for RWAs.</li> <li>- Service Contract launched for RWAs.</li> <li>- Regulatory body in place.</li> </ul>	CDR in association with MOF, MOEW, RWAs
<b>Sustainable Use of Water Resources.</b>	MOEW 10 Year Programme: <ul style="list-style-type: none"> <li>- Shabrouh Dam</li> <li>- Brissa Dam</li> <li>- Extension of Dbayeh Water Treatment Plant.</li> </ul>	Finalizing the evaluation of tenders for Canal 800.	<ul style="list-style-type: none"> <li>- Appointment of consultant to update the studies relating to Awali-Beirut Conveyor, Bisri Dam.</li> <li>- Appointment of a committee of experts to recommend guidelines for re-use of treated wastewater.</li> <li>- Complete GPOBA study.</li> </ul>	Secure finance for: <ul style="list-style-type: none"> <li>- Boqaata, Assi, Nahr Ibrahim, Nahr El Bared &amp; Bisri Dams.</li> <li>- Awali-Beirut Conveyor.</li> <li>- WSS O&amp;M ( South &amp; Bekaa regions) for RWAs.</li> </ul>	Start construction of the Dams and the conveyor.	MOEW & CDR in association of MOF & MOA.
<b>Strategy for Sanitation, and Targeting the Poor.</b>		<ul style="list-style-type: none"> <li>- Apply for GPOBA funding for targeted subsidies to low income communities.</li> <li>- Apply for BNWPP.</li> </ul>		<ul style="list-style-type: none"> <li>- Implement GPOBA.</li> <li>- Secure Donor funding for implementing recommendations of the feasibility studies for sanitation.</li> </ul>	<ul style="list-style-type: none"> <li>- GPOBA report and launching implementation.</li> </ul>	MOEW in association with MOF/ CDR & RWAs.

## Annex 7: Organizational Chart of the Ministry of Energy and Water (MEW)

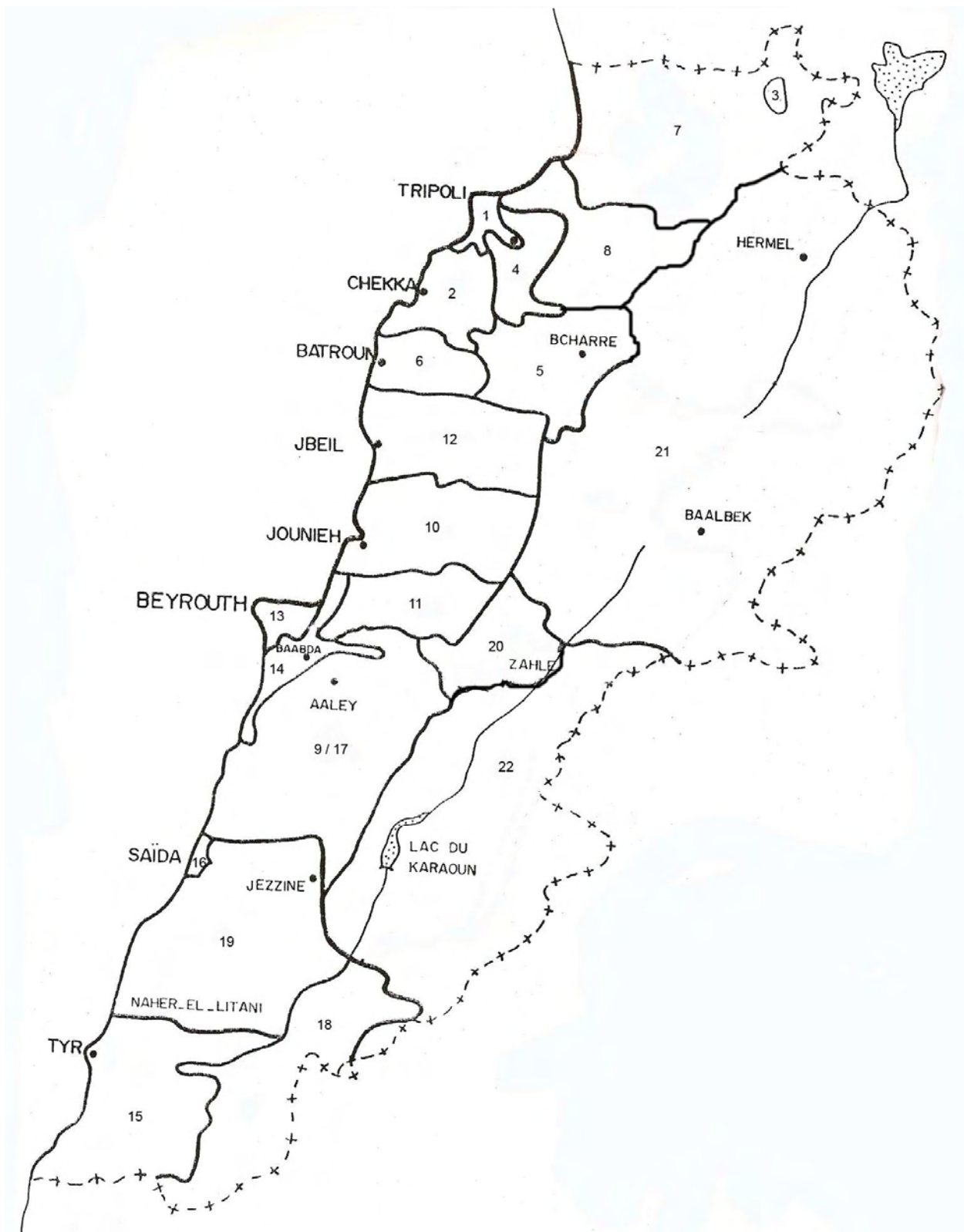






**Annex 8: List and map of the old Autonomous Water Offices (AWOs) (Comair, 2006)**

No	Regional Water Authority/Committee	Caza
North Lebanon Mohafazat		
1	Tripoli Water Board	Tripoli & Akkar
2	Nabaa AI-Ghar Water Committee	Koura
3	Kubayat Water Board	Akkar
4	Nabaa AI-Kadi Water Committee	Zgharta
5	Becharre Water Committee	Becharre
6	Batroun Water Committee	Batroun
7	Akkar	Akkar
8	Danniyeh	Tripoli (Danniyeh)
Beirut Mohafazat		
13	Beirut Water Board	Beirut, Metn & Baabda
14	Ain el Delbeh Water Board	Mount Lebanon
Mount Lebanon Mohafazat		
9	Barouk Water Board	Baabda, Aley & Chouf
10	Keserouane Water Board	Keserouane
11	Metn Water Board	Metn
12	Jbeil Water and Irrigation Com.	Jbeil
South Lebanon Mohafazat		
15	Sour and Surroundings Water Board	Sour
16	Saida Water Board	Saida
17	AinEd-Delbeh Water Board	Baabda, Aley & Chouf
18	Jabal Amel Water Board	Marjayoun, BentJbail, Hasbaya Sour
19	Nabaa EI-Tasseh Water Board	Saida Jezzine, Nabatiyeh & W. Bekaa
Bekaa Mohafazat		
20	Zahle and Surroundings Water Board	Zahle & West Bekaa
21	Baalbek Hermel & Irrigation Board	Baalbek & Hermel
22	Chamsine Water Board	Zahl, W. Bekaa, Rachaya & Hasbaya

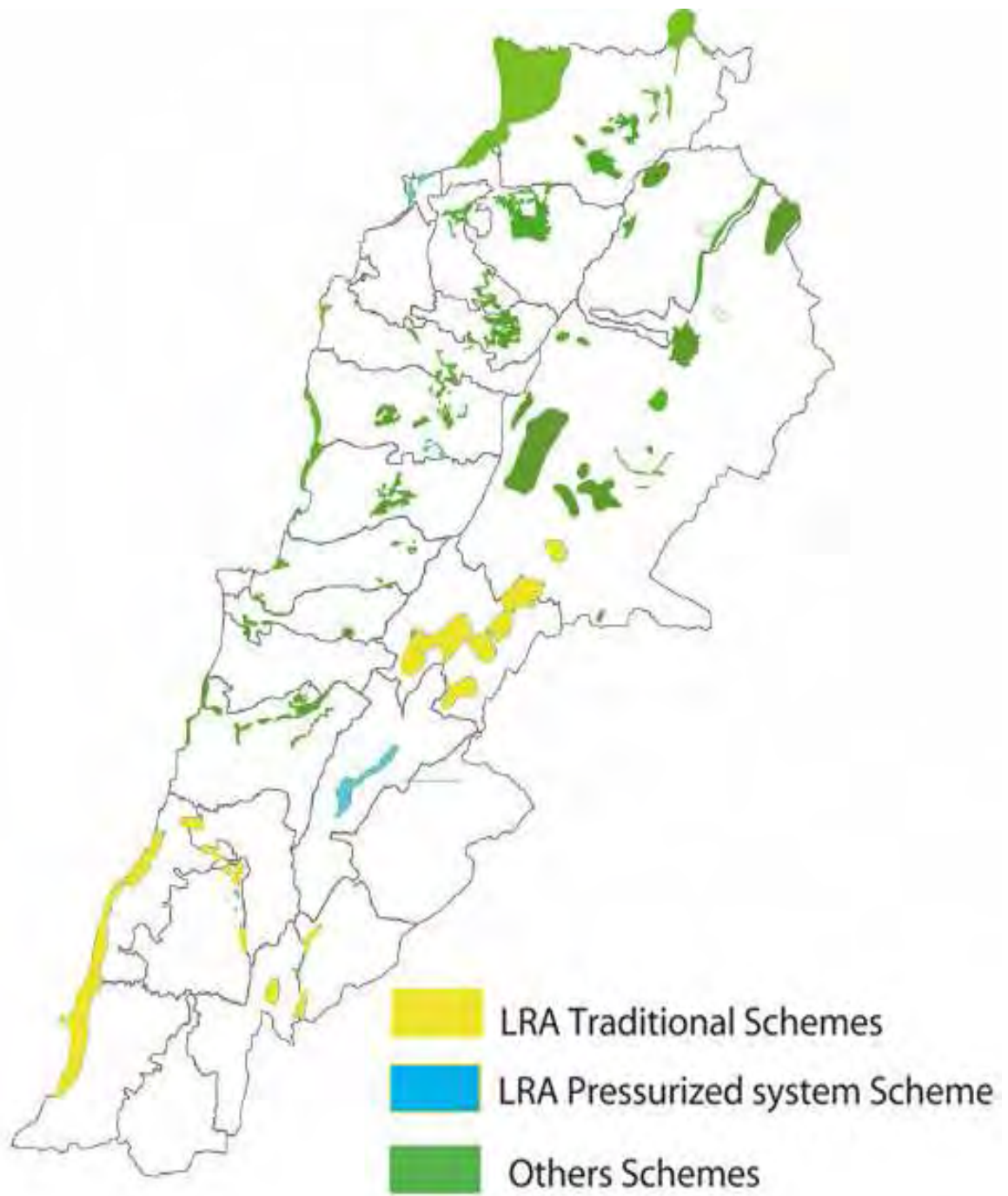


## Annex 9: List and map of existing irrigation schemes in Lebanon (MEW & LRA)

CODE	SCHEME NAME	EQUIPPED AREA (ha)
1	Akoura-Laqlouk	1,100
2	Qartaba & Surroundings	250
3	Lassa, Ghabat, Mezarib, Mghairi, Afqa & Surroundings	120
4	Ehmej and Surroundings	700
5	Adonis (Kesserouan)	400
6	Kfardebian and Faraya	540
7	Mayrouba and Hrajel	340
8	Nahr El Kalb - El Wata	80
9	Beskinta-Sannine and Bekaata	320
10	Antelias	100
11	Hammana - Tarchich-Aintoura & Surroundings	200
12	Dayshounieh- Hazmieh & Surroundings	100
13	South Beirut Suburbs	300
14	Wadi Chahrour & Surroundings	200
15	Nabaa Es Safa	860
16	Jahiliye	150
17	Dammour Plain	400
18	Jiyeh	100
19	Nabaa El Barouk	280
20	Bouqaiaa	1,100
21	Mashta Hassan-Mashta Hammoud-Chadra	810
22	Akkar El Attica	560
23	Akkar Highland Farms-Karm Sbat & Surroundings	200
24	Fneideq-Mechmech	990
25	Joumech Area- Rahbeh - Takrit & Surroundings	400
26	Akkar Plain and Arka River	8,000
27	Akkar El Bared	800
28	Minieh	1,220
29	Tripoli	200
30	Zgharta	500
31	Danniyeh	5,000
32	Ehden	450
33	Bcharre	840
34	Tannourine	330
35	Kfarhilda	80
36	Batroun Plain	100
37	Saida-Jezzine	390
38	Qasmieh - Ras El Ain	4,440
39	Hermel High land Farms	1,100
40	Marjhine	160
41	Hermel Watershed	650
42	Assi Plain	400
43	El Qaa	3,000
44	Oyoun Taqtaq	100
45	Ras Baalbeck	300



46	Laboue	2,080
47	Chaat & Surroundings	800
48	Younine	100
49	Oyoun Orghosh - Barqa-Nabha & Surroundings	400
50	Yammouneh	5,600
51	Wadi Nahle & Surroundings	150
52	Iaat Plain	270
53	Baalbeck Plain-Douris & Surroundings	2,000
54	Haouch Barada - Majdaloun & Surroundings	1,000
55	Talia & Surroundings	1,000
56	Yahfoufa, Jenta, Seraain & Surroundings	1,670
57	Maaraboun & Ham	120
58	Rayak, Ali Nahri & Surroundings	870
59	Terbol - Delhamieh & Surroundings	1,500
60	Zahle & Surroundings	2,000
61	Chtaura - Qab Elias Plain	2,000
62	Anjar-Chamsine & Surroundings	1,500
63	South Bekaa (Phase I), Left Bank	2,220
64	Iqlim El Touffah	320
65	Nabatiyeh (Al Midane Plain)	220
66	Marjeyoun & Khiam Plain	620
67	Hasbani	500
	Total	65,600



## Location of Existing Irrigation Schemes

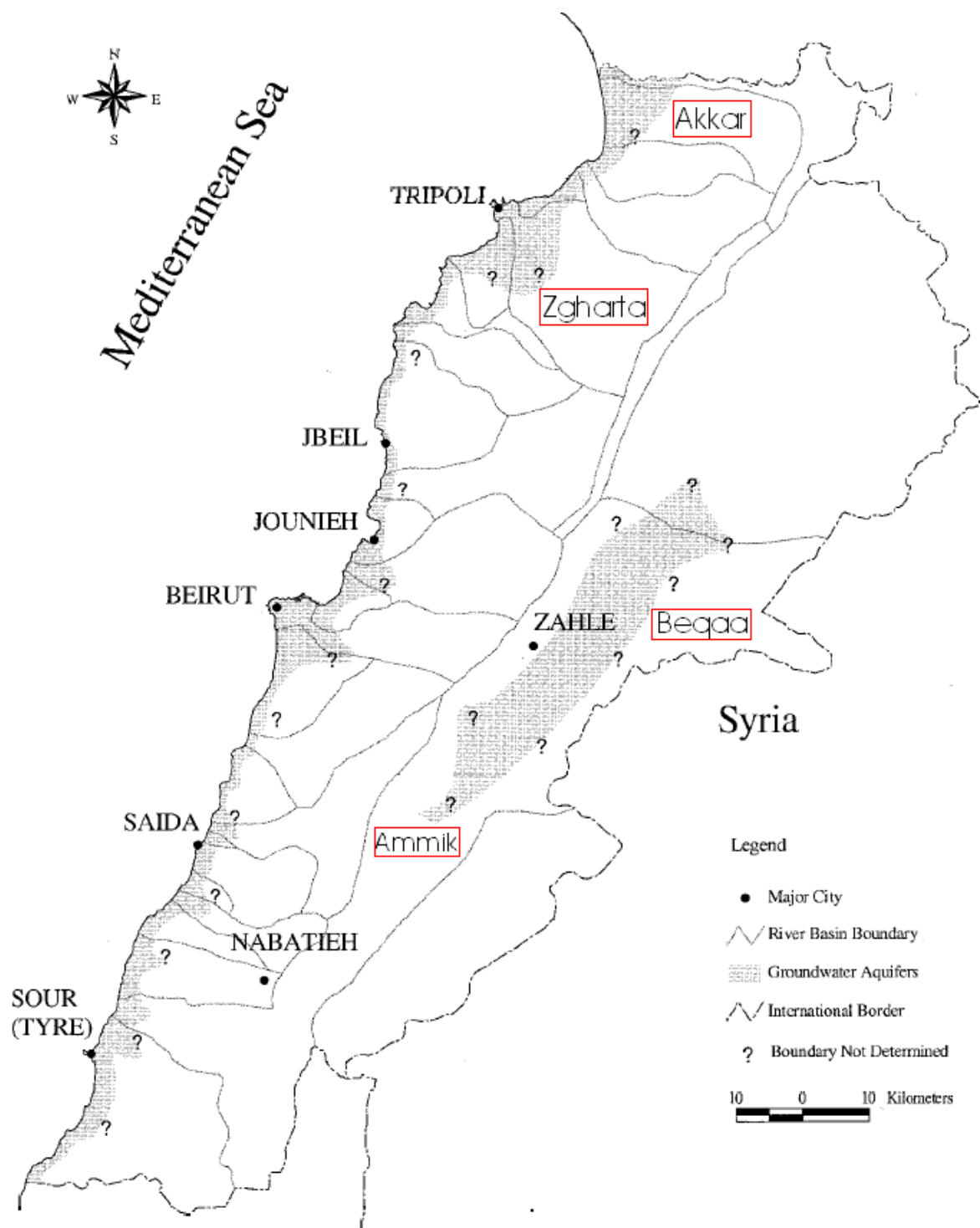




## Annex 10: List and map of groundwater aquifers in Lebanon

Region	Aquifer	Water volume (Mm <sup>3</sup> )	Irrigated area (ha)
North Lebanon	Plio-Quaternary Akkar	26	2.500
	Miocene Koura Zgharta	2	200
	Other	7	700
Mount Lebanon	Lower Cretaceous	1	100
	Middle Coastal Cretaceous	1	100
South Lebanon	Middle Cretaceous Western basin	71	6.810
	Coastal Eocene	7	800
	Coastal Quaternary	2	190
Anti-Lebanon	Middle Cretaceous of Anti-Lebanon	7	750
	Eocene of Anti-Lebanon	24	2.590
	Neogene-Quaternary	41	4.160
Southern Bekaa	Jurassic of Amik	52	5.800
	Eocene/Middle Cretaceous of Bekaa		
Total		241	24.700

Ground water in Lebanon according to region, aquifer, pumping and area irrigated (Abdallah, 2002)



**Major Groundwater Aquifers of Lebanon** (El Fadel et al., 2000)

## Annex 11: Photos of hill lakes in Lebanon







## Annex 12: Photos of agricultural terraces in Lebanon







### Annex 13: Mchaytiyyeh: Map and pictures

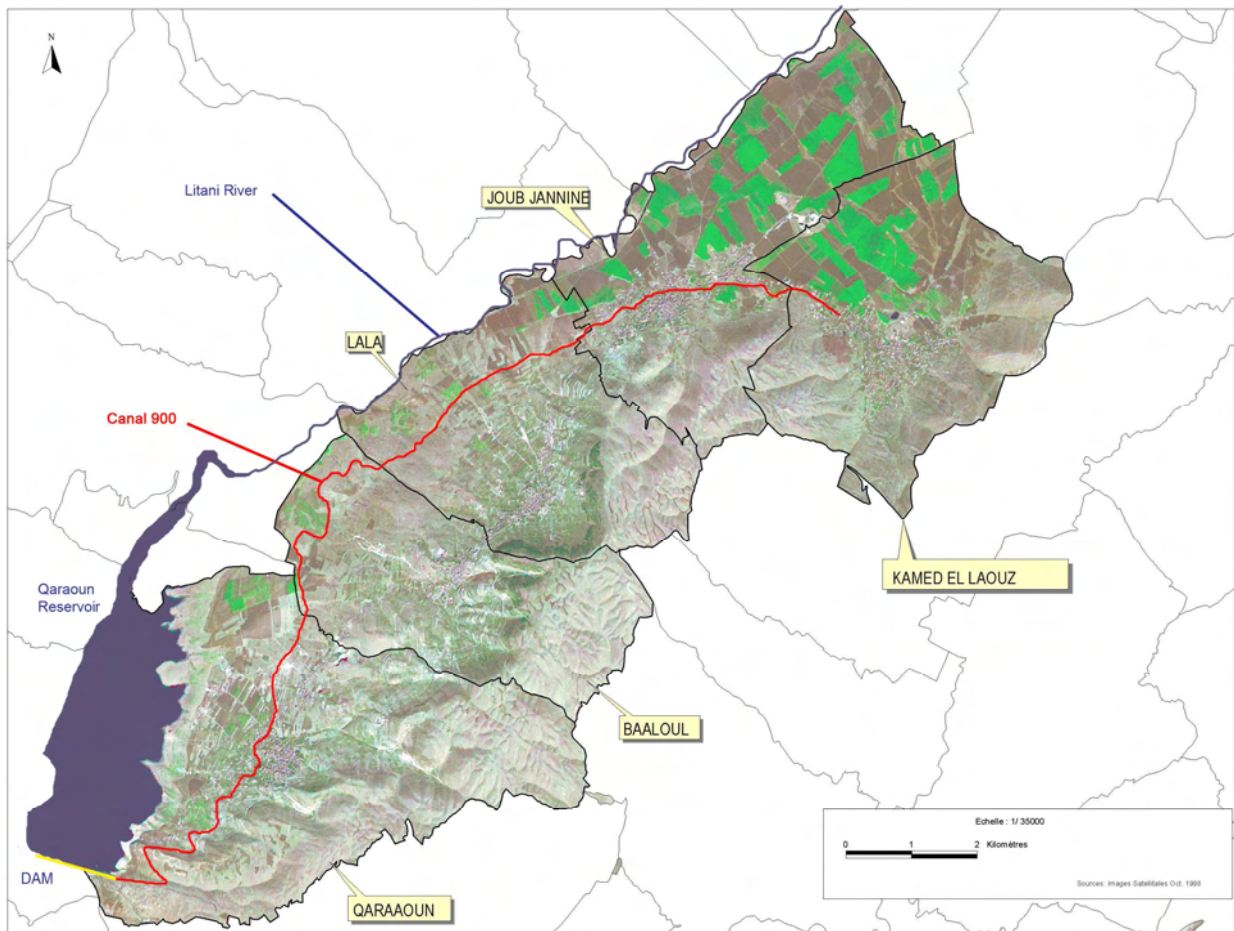






**Annex 14: South Beqaa Irrigation Scheme: Map (Gedeon, 2007) and pictures**









## Annex 15: Jabbouleh: Pictures (LARI)









## Annex 16: Marjeyoun: Map (AVSI) and pictures



