



# Euro-Mediterranean Information System on Know how in the Water Sector

## Technical and financial feasibility studies of the National Water Information Systems in 12 Mediterranean Countries

Country Report –Lebanon  
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## Acronyms & Abbreviations

Acronym/abbreviation	Meaning
CDR	Council for Development and Reconstruction
CNRS	National Council for Scientific Research
DoE	Directorate of Exploitation
DoHER	Directorate of Hydraulic & Electric Resources
DSU	Decision Support Unit
EEB	Bekka water Establishment
EEBML	Beirut and Mount Lebanon Water Establishment
EELN	North Lebanon Water Establishment
EMWIS	Euro-Mediterranean Information System on Know-how in the Water Sector
EU	European Union
FAS	Financial Accounting System
GIS	Geographic Information System
GW	Groundwater
HR	Human Resources
HTML	Hyper Text Markup Language
ISP	Internet Service Provider
IPP	Investment Planning Program
MEW	Ministry of Energy & Water
MWER	Ministry of Water and Electrical Resources
NFP	National Focal Point
NGO	Non-Governmental Organization
NWIS	National Water Information System
ONL	Litani River Authority (Establishment)
SCADA	Supervisory Control and Data Acquisition
SEMIDE	Système euro-méditerranéen d'information sur les savoir-faire dans le domaine de l'eau
SH	Stakeholder
SLWE	South Lebanon Water Establishment
SOP	Standard Operating Procedures
SQL	Structured Query Language
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TOR	Terms Of Reference
URL	Unified Resource Locator
USAID	United States Agency of International Development
WQ	Water Quality
XML	eXtensible Markup language

## COUNTRY REPORT SUMMARY

The Lebanon, in-country consultation visits started on 3<sup>rd</sup> of October 2005 and ended on 5<sup>th</sup> of October 2005. The project's experts conducted interviews with general directors of the Ministry of Energy and Water (MEW) and its water establishments. Interviews officially took place with seven entities. Although all interviews were only focused on MEW and its establishment, all of these establishments will be considered as stakeholders. During these interviews EasyInfo collected data by filling specially designed questionnaires.

The stakeholders met were previously selected by the EMWIS/National Focal Point; the MEW. The stakeholders are:

- MEW/Directorate of Exploitation (DoE)
- MEW/Directorate of Hydraulic & Electric Resources (DoHER)
- Beirut and Mount Lebanon Water Establishment (EEBML)
- South Lebanon Water Establishment (SLWE)
- North Lebanon Water Establishment (EELN)
- Establishment of the Bekaa'
- Litani River Authority (ONL)

It is worth mentioning here, that one joint meeting was conducted for the both the Water Establishments of the North and Bekaa' together. The Director of the North Establishment was covering for the Beka'a since he was also temporarily the Director of Bekaa' Water Establishment.

A joint focus group meeting was conducted at the end of the visit to discuss issues related to difficulties in water information exchange and the reasons behind the inefficiencies and obstacles foreseen in establishing NWIS. All stakeholders attended the meeting with the exception of the General Director of the Water & Electric Resources. The meeting was chaired by **EasyInfo** Consultants. It was evident from the meeting that due to the recently developed water establishments, the need for NWIS has started to arise. However, in order to get to an automated data exchange system through NWIS, institutional SOPs for data collection and exchange need to be tested before the process of computerization begins.

Analysis of the collected information during interviews and the focus group meeting revealed the following findings:

On 3/10/2005, the water sector in Lebanon had a major organizational restructuring. Twenty water authorities were merged into four public institutions (i.e. EEBML, SLWE, EELN, and Bekaa'). The MEW became the public organization responsible for supervision of these four establishments. This restructuring was based on the law 221 that was issued in May of 2000, amended by the law 241 in August of 2000, and further amended by the law 337 of 2001.

- Stakeholders in Lebanon are interested in NWIS on the national level and are willing to go forward provided that they get financial aid, since they do not have financial resources.
- Stakeholders are not sharing all of the information because prior to the restructuring there was no need to exchange much data. Stakeholders that share data are facing the following difficulties;

- Lack of raw data because many stakeholders do not measure data (i.e. water levels, production and consumption)
- Unreliability of information due to lack of metering, errors in estimation, and inaccuracies
- Data provision depends on personal contacts and there are not SOPs for the exchange of data between stakeholders
- Most stakeholders have just started the computerization process and water information are still on hardcopies
- There are no internet links for data exchange
- Lack of coordination between donor projects that are working on the upgrade of the IT systems and collection of data. This resulted in duplication of efforts and inefficiencies
- Lack of qualified staff due to a freeze in hiring
- Lack of financial resources

The causes and effects of these problems are clearly depicted in the graphical problems tree shown in the report.

- Prior to the implementation of NWIS there are major steps to be taken in the stakeholders institutions to upgrade their data collection procedures, enhance or develop database systems and establish web sites.
- The analysis further revealed that the main reasons behind the unavailability of NWIS in Lebanon are attributed to the following:
  - Lack of the institutional structure and technical infrastructure to collect, store and share data (this is expected to change due to the recent institutional restructuring)
  - Lack of financial resources
  - Stakeholders are not fully aware of the benefits of data exchange
  - No standard operating procedures for data exchange in some stakeholders
  - The political situation
  - Unavailability of data
- Establishing NWIS system in Lebanon may face the following obstacles;
  - Failure to get political decision to establish NWIS
  - Lack of financial resources to improve and upgrade stakeholders' information systems
  - Unavailability of staff and vacant import positions due to the hiring freeze
  - Delays and problems (if any) in the implementation of the new institutional setup
  - Unavailable and unreliable data
- The analysis in the report further went into SWOT analysis that assessed the strengths, weakness, opportunities, and threats that will face the establishment of NWIS in Lebanon. It should be noted, however, that despite the many weaknesses and threats mentioned, there are opportunities in Lebanon that will greatly support the stakeholders prior and during the establishment of NWIS and is highly recommended to be utilised, these opportunities are:
  - The first opportunity is the concurrent donor projects like the IPP and the FAS. These projects are working to upgrade the data collection, storage and exchange. With better coordination the work can better serve the overall goal of establishing a NWIS.

- The second opportunity is that the stakeholders are starting to recognize the importance of NWIS especially after the development of the new water establishments. MEW recognizes the importance of sharing of data on the national level and even some data on the regional level to aid in the negotiation, planning, and research.
- The following water information types exist at the stakeholders that were interviewed but are mostly on hardcopies; some are on computers;
  - Quantitative/maps
  - Grey Literature
  - Water Legislation/strategies
  - Training/conferences
  - Standards and best practices
- Not all stakeholders have web sites. Web sites are crucial to the exchange of information.
- Currently, none of the stakeholders can be considered to be technically ready to act as a backend server in a distributed database setup under the NWIS envisioned. Some stakeholders' IT systems are not even adequate for their own current data collection and sharing. Internet connections are mostly not available at the stakeholders' institutions and for the other stakeholders; they are relatively slow and need to be enhanced.
- Many stakeholders did not know about the specific benefits of NWIS to them. It is necessary to demonstrate to stakeholders that NWIS is needed. The EMWIS coordinator advised that an awareness campaign be conducted to demonstrate to the stakeholders the importance of NWIS, the specific benefits, and the success stories in other countries.
- Stakeholders did not mention any objection on who should manage the NWIS as they are legally under the MEW.
- The report also analyzed the questionnaires filled during the consultation with the stakeholders. The stakeholders' interests, capacity, motivations and possible actions to address their needs were detailed in the stakeholder analysis matrix included in the report. Relationships between stakeholders were also analyzed by a Venn diagram which shows all stakeholders met are water data generators. The six stakeholders met exchange information amongst each other with the exception of EEBML.
- It is highly recommended to implement NWIS in Lebanon in two stages. First stage is the pre-NWIS preparation stage and the second is the NWIS development stage. The most important steps in the preparation stage are the collection and monitoring of major water sources (i.e. water levels and production flows) and implementing SOPs for data collection and exchange.
- It is also recommended to establish the institutional mechanism to ensure the proper coordination between stakeholders, since currently; there are duplication of efforts which is creating inefficiencies in the development of automation systems for water information.

- It is also recommended that in order to reduce the time, effort and cost needed for development and upgrade of the stakeholders' IT capabilities in Lebanon, demonstration and learning from other countries success and failure stories might prove beneficial
- A major step towards the implementation of NWIS in Lebanon, is the creation of web sites and establishment of internet connectivity
- As a conclusion from the analysis, it is still early to fully envision a system for NWIS in Lebanon. Priority should be given to setting up data collection and exchange procedures, institutionalization of these procedures, collecting the data and then an automated solution can be envisioned. A general conceptual design for the **envisioned NWIS** is proposed and shown in the report in section 3.1. The main participants of NWIS are proposed to be all the water authorities in Lebanon. It is also recommended that MEW act as the coordinator and host of the NWIS system but after qualified staff are appointed to follow-up and manage the system. It is also proposed that all stakeholders met should coordinate and unify their efforts to adopt one Water Information System (WIS) at their establishments since they all have same responsibilities but in different geographical areas in Lebanon and would have the same needs. The WIS system proposed should be a web-based application with distributed databases maintained regularly by stakeholders.
- To implement an NWIS in Lebanon, the following roadmap is recommended:

#### **For the pre-NWIS development stage**

1. Complete survey of all water supply sources
2. Measure water sources that are not currently measured and establish water resources monitoring departments where applicable
3. Ensure that data is exchanged between all stakeholders that need the data
4. Develop standard operation procedures for the exchange of data between stakeholders
5. Ensure coordination between donor projects by creating a coordination committee
6. Support the computerization and development of databases
7. Obtain the political decision to hire more qualified staff
8. Fill in the vacant positions in the organization structure
9. Develop specialized data collection and IT departments within each stakeholder
10. Support the installation of internet for every stakeholder
11. Develop and implement web sites for every stakeholder

#### **For the development of NWIS stage**

1. Conduct an awareness campaign to demonstrate further the benefits of NWIS and transfer other countries' successful stories about NWIS (e.g. Algeria)
2. Get decision makers approval to move forward with the implementation of NWIS.
3. Set up an NWIS committee. This committee will ease the process of sharing water resources information and will set the road to establish NWIS.
4. The committee should finalise the overall NWIS concept
5. Get funds for NWIS development
6. Conduct a detailed study for the technical design of NWIS.
7. Develop the NWIS systems and its stakeholders' components

It was agreed that the exact costing of all the required systems was beyond the scope of this study. Therefore, rough costing was performed. A separate detailed study is required in order to define the

exact cost for implementing Pre-NWIS stage and the NWIS development stage in Lebanon. The proper costing includes many variables that depend on what is currently available and what are the exact needs of the system envisioned. A rough estimate of the cost of such system is in the range of 272,000 Euro to 375,000 Euro in addition to the In-kind contribution. Funds need to be secured to establish this system in Lebanon.



## BACKGROUND

The SEMIDE/EMWIS project has started since 1999 with a main objective to “Facilitate access to the existing know-how in the water sector and develop the sharing of information along with preparation of common outputs and cooperation programs between the participating countries“.

During the course of its execution, the project defined some problems which affected the advancement and development of the EMWIS project and accordingly reflected on the EMWIS international system. Some of those identified problems are:

- The difference in the level of advancement (and sometimes the absence) of National Water Information Systems in the participating countries: some countries have advanced systems while others have barely started. This difference leads to problems in coordination and communication.
- Lack of coordination between organizations and institutions within the same country which results in data gaps, duplication and discrepancy.
- Difficulties to access data, whether because of technical reasons or lack of policies for data access.
- Availability of data in different formats.
- Lack of water data access policies.
- Differences in ICT infrastructures, human resources capacity and in adopted processes for data collection, transfer, storage and dissemination in the participating countries.
- Some countries address the issue of water information in their varying organizations using a micro approach rather than a macro approach. This approach has led to fragmented systems lacking consistency and integration. These countries might need guidance to a more holistic approach in building water information systems which leads to a more coherent multi-stakeholder water information system on a national level.

To solve these problems, EMWIS is now looking at the enhancement of the National Water Information Systems (NWIS) in the participating countries. It is anticipated that improvement of these NWIS systems would improve and harmonise data/information exchange and sharing between the participating countries. It is also anticipated that this improvement will have a direct impact on the quality, availability and flow of information from the participating countries' NWIS to the EMWIS international system via the national focal point in each participating country.

EMWIS awarded **EasyInfo** Consulting Company to conduct a feasibility study to assess the current situation of national water information systems in 12 Mediterranean countries: Algeria, Cyprus, Egypt, Israel, Jordan, Lebanon, Malta, Morocco, Syria, Tunisia, Turkey and Palestine.

The main purpose of the study is to recommend actions to enhance the National Water Information Systems (NWIS).

The main objective in pursuing enhancement and improvement of the NWIS in the participating countries is to remove all obstacles at the national level that impede the advancement of the NWIS and, as a consequence, improve and harmonise data/information exchange and sharing between the participating countries and the EMWIS international system via the National Focal point in each participating country. Improvement of the National Water Information Systems will improve the overall EMWIS system.

This study represents the first step for NWIS enhancement by identifying recommended actions for improvement of the Water Information Systems in each country.

# 1. DATA AND INFORMATION COLLECTED IN LEBANON

## 1.1. Information about Stakeholders

Stakeholders of water information in Lebanon were identified by the National Focal Point (NFP) of EMWIS Project; MEW. They are all establishments within the MEW as follows;

- MEW/Directorate of Exploitation (DoE)
- MEW/Directorate of Hydraulic & Electric Resources (DoHER)
- Beirut and Mount Lebanon Water Establishment (EEBML)
- South Lebanon Water Establishment (SLWE)
- North Lebanon Water Establishment (EELN)
- Establishment of the Bekaa'
- Litani River Authority (ONL)

During the course of this study and after the meeting with these stakeholders, other institutions in Lebanon were identified and can be considered as stakeholders of water information. The Council for Development and Reconstruction (CDR) were mentioned by several stakeholders as being major stakeholder. The CDR is a public authority established in early 1977, partially in replacement of the Ministry of Planning, to be the government unit responsible of reconstruction and development.

In addition to CDR, the following is the list of stakeholders that can supply part of the information required to the NWIS in Lebanon, these stakeholders maybe be considered when developing a NWIS as they can be providers and/or users of information to the system:

Council for Development and Reconstruction (CDR)  
Ministry of Environment  
Ministry of Health  
Ministry of Education  
Council of the South  
Ministry of Public Works  
Ministry of Defence  
International bodies  
Parliament

Data collected from stakeholders during meetings are documented in questionnaires. These questionnaires are included in the annex A.

## 1.2. Current Situation of Available Systems

The main stakeholders of water information in Lebanon listed in the previous section (i.e. MEW/Directorate of Exploitation (DoE), MEW/Directorate of Hydraulic & Electric Resources (DoHER), Beirut and Mount Lebanon Water Establishment (EEBML), South Lebanon Water Establishment (SLWE), North Lebanon Water Establishment (EELN), Establishment of the Bekaa', and Litani River Authority (ONL) are currently partially exchanging information among them. The new institutional arrangement that has been applied on October 3<sup>rd</sup>, 2005 is creating the need for better data exchange. For stakeholders that are currently exchanging data, they are facing difficulties in the exchange process. Among these problems are:

- Some important data and information is not being measured (generated)
- Some data are not being exchanged
- Some stakeholders previously did not feel the need for the data exchange because of lack of organizational setup which now has a new set up.
- No set procedures for data exchange
- No enough human resources due to the freeze in hiring in the public sector
- Lack of experience
- Much of the information is on paper for 50 years and not computerised yet.
- Weak IT infrastructure and lack of internet communication
- Still there is no political decision, but it is not anticipated to face any problem regarding that.

All these difficulties need to be addressed as they reflect adversely on the information exchange process and are impacting the performance of stakeholders and other information seekers. These problems will also affect the development and management of a NWIS.

All of the stakeholders met in Lebanon are generators of water information. Most of the water establishments exchange water information with the MEW mainly through hardcopies documents and some automatically (via email, intranet, diskettes or CDs)

Not all stakeholders have web sites. The MEW has its main website through the SEMIDE web site but it has become outdated and needs urgent updating. MEW is in the process of developing a new website. The EEBML and EELN have a functional websites; however, the ONL and SLWE, on the other hand, do not have a website.

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

Formerly, the Ministry of Energy and Water (MEW) was named Ministry of Water and Electrical Resources (MWER). The Ministry for Energy and Water is the main EMWIS National Focal Point (NFP). MEW is a central public organization in charge of water resources and its utilization in Lebanon. MEW consists of 3 general directorates. They are:

- The General Directorate of Hydraulic and Electric Resources,
- The General Directorate of Exploitation,
- The General Directorate of the Petroleum.

The MEW is responsible to set the vision of water resources utilization and exploitation. MEW has the legal mandate to develop the Lebanon National Water Policy and the National Master Plan

including water database development for the purposes of planning. Database administration and data warehousing is, also, within that mandate. MEW has not yet built a major database system and computer infrastructure, but, is considering doing that soon.

In the country visits, only the first two MEW Directorates were interviewed because they deal with water issues and are considered main stakeholders. They are;

**General Directorate of Hydraulic and Electric Resources (DoHER):**

This directorate has the role of planning and studying, constructing, and supervising the execution of water projects. It also has the responsibility of applying the laws and regulations related to the protection of public water and its utilization towards water supply or electrical generation. The consultant only met the director and could not assess the current database systems they have from that meeting.

**General Directorate of Exploitation: (DoE)**

The main responsibilities of MEW/DoE lay in the supervision of the four newly reorganized public establishments working in the water sector. It also ensures the administrative and financial control of these organizations and to manage the issuance of tender documents and specifications related to the exploitation of water. Finally amongst its responsibilities, DoE, studies the complaints and measurements necessary to regulate the infringements committed by the organizations working in the water sector. It is substantive to mention here that from the country visit it was evident that this directorate has no computerised water information system and it is in need to establish a database. No web site exists for this directorate.

As of October 3<sup>rd</sup>, 2005, MEW has merged the 21 water offices into 4 institutions called establishments. The reorganization was according to the law 221 dated May 2000 and according to it is amendments (laws 241 and 337). The four establishments are:

- Water Establishment of Beirut and Mount Lebanon
- Water Establishment of South Lebanon
- Water Establishment of North Lebanon
- Establishment of the Bekaa

It is within the responsibility of the Water Authorities to supply water to consumers. Recently, the responsibility of wastewater collection and treatment is transferred to these water authorities from the Ministry of Interior and Municipalities. These authorities also fix the water prices to recover the maintenance and renewal costs of the existing network and infrastructure.

From the country visit the following current situation was revealed;

**Water Establishment of Beirut and Mount Lebanon (EEBML)**

It is responsible for the water supply to Beirut city and villages in Mount Lebanon. It has metadata of springs, wells and dams within its jurisdiction. It also has the water production and the amounts billed to customers. It monitors the discharge and supply into the supply zones through telemetry system connected to SQL servers. It has a GIS system that is linked to the main database which is on ACCESS. There are three staff members dedicated to the IT department. Internet is available but is not used for data exchange. A web site exists in Arabic.

**Water Establishment of South Lebanon (SLWE)**

SLWE is responsible for the supply of water and management of wastewater in the South of Lebanon and Nabatieh Governorates. Their service area is around 20% of the total area of Lebanon. SLWE is in charge of 252 water supply sources. They are experiencing a problem of lack of qualified staff. With the financial assistance of USAID, SLWLE has developed a cost recovery and accounting system. Part of the system is ready. This system is currently operated in Excel environment. SLWE has also a GIS system with digital maps but has no computerized information or database system. SLWE has not web site.

### **Water Establishments of North Lebanon (EELN) and the Bekaa**

EELN is responsible for the water supply of North of Lebanon including around 50,000 customers in Tripoli and 11,000 customers in Koura. The network maps are on GIS for Tripoli and Koura. They do not have reliable information on irrigation in the north. Water productions from sources are not metered and, therefore the numbers are all estimates. Currently the use of computers is minimal. EELN does not have a web site and there is no internet access to the staff. The need for NWIS is highly recognized. The Establishment of the Bekaa' is one of the four water establishment and has similar responsibilities as EELN but for the Bekaa' region. No information on the current available systems was given to the consultant.

### **Litani River Authority, ONL**

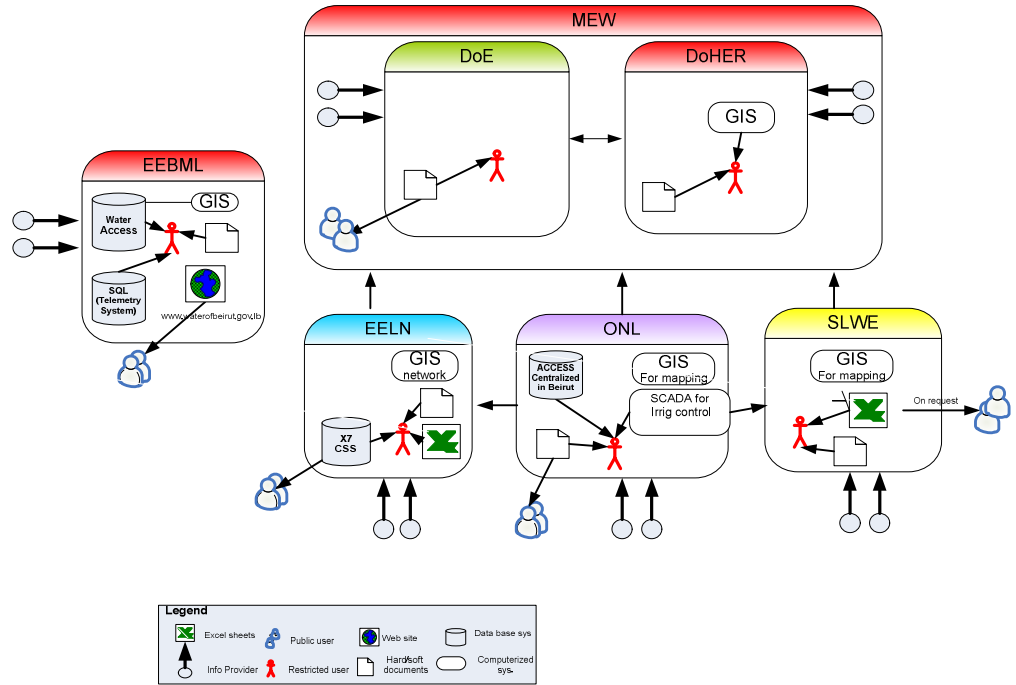
Originally established in 1955 to exploit Litani River, store, produce hydro-electricity, and operate irrigation. It is presently in charge of the irrigation system in the South and Bekaa. ONL is also considered the bulk water supplier for the South Lebanon Water Establishment. The Law 221 of year 2000, under its item no. 8 allowed the ONL and its committees to continue the management and exploitation of the irrigation within its jurisdiction (South Bekaa' and South of Lebanon).

ONL has a computer connection between the main offices in Beirut and the regional office in Litani. This connection is used for data exchange. ONL uses SCADA system for irrigation control. All data are stored in ONL offices in Beirut and the access of information to that database is done through a client server application. The web site is already designed but still not public.

It is evident from the above that there are no well-established data bases in the stakeholders' institutions and that not enough data and information is being exchanged. This will change especially after the just-completed organizational restructuring. It was mentioned during the interviews that the need for data exchange has become a priority after the reorganization of the water sector.

The figure below represents the current situation of water information flow and systems in Lebanon.

**Current situation of water information data flow and systems in Lebanon**



### 1.3. Future Plans

Most of the stakeholders met have future plans to upgrade and improve their data exchange systems. These improvements ranged from development of database systems on the national level to merely improvement of webs pages. There are several donors' agencies working to upgrade the information systems and the collection of data. However, there is not enough coordination between the agencies to avoid duplication of efforts. The following is a detailed description of the future plans for each stakeholder met:

#### **General Directorate of Hydraulic and Electric Resources (DoHER)**

This directorate is currently working through the EU to embark on the measurement of groundwater levels (piezometric heads). This directorate is keen to implement a NWIS to exchange data and help in planning, negotiation and research. Actually, this stakeholder expects EMWIS to provide or harmonise data for trans-boundary rivers.

#### **General Directorate of Exploitation: (DoE)**

DoE, being part of the Ministry, is in the process of updating the web site that is on the SEMIDE web page. DoE started to computerize water quality analysis results performed by the Coordination Unit. This stakeholder will also start to exchange with the four newly formed establishments information on water production, wastewater, water consumption, and irrigation quantities. This directorate wants to be transparent when providing water information. The DoE is interested to have NWIS in order to ease and expand the data exchange under the new reorganization of the water sector. This stakeholder is advising that NWIS begins as a local system in DoE and remains internal to the Ministry since; release of data to the public is still restricted and needs political approval from the Minister.

#### **Water Establishment of Beirut and Mount Lebanon (EEBML)**

EEBML is currently in the process of collecting survey data on the different users' water sectors and their water consumption. This establishment is planning to link the customers' data with the GIS in three months time. EEBML is currently improving their IT systems and building the capacity of the staff as they are developing a new IT section. This stakeholder is planning to start collecting data from the Litani River Authority on irrigation, spring discharge, and groundwater. It is also planning to collect water information on new projects from the Council for Development and Reconstruction. EEBML will collect wastewater information from the municipalities and data on treatment plants from the Ministry of Municipalities since they became responsible for the wastewater collection and treatment. On the EEBML's future plans to improve the information exchange, is the release of their information to the Ministry of Energy and Water (well licensing). There is no sharing of information with the other institutions. In addition to that, the Bureau of Statistics, Ministry of Municipalities and the Litani authority will have access to EEBML water information.

#### **Water Establishment of South Lebanon (SLWE)**

SLWE is currently improving its capacity to monitor resources by the installation of 70 flow meters on main springs and wells with the financial assistance of USAID. This stakeholder is also setting up a financial accounting system (FAS) that will be ready in 2006. SLWE is planning to develop a master plan on wastewater. The official web site is under development and will include information on legislation and customers' bills. This stakeholder is keen to improve their IT capability of their staff by creating a human resources department. The SLWE is willing to share data with others stakeholders through NWIS as long as it does not threatens the national security. This stakeholder



does not have a clear vision on the ideal NWIS system since SLWE has recently undergone institutional restructuring. However, the need for NWIS is clearly concluded.

### **Water Establishment of North Lebanon (EELN) and the Bekaa'**

EELN is undergoing computerization of their data. A decision support unit (DSU) is being developed with the main responsibility to collect and verify data. Treatment plants are being constructed for Tripoli and other locations. EELN recognizes the need to survey their water sources. EELN believes that there are experiences in the South, North and Bekaa' regarding the collection and information system that should be shared and exchanged between all institutions. This stakeholder agrees to the importance of having NWIS and that it will help in the coordination issues between government water establishments. NWIS is needed on the national level. No detailed description on the future plans to enhance the IT systems in the Establishment of the Bekaa' were rendered

### **Litani River Authority, ONL**

ONL is working to install telemetry systems with IPP project. The IPP project will provide 3 stations that will measure water quality and quantity. The ONL official web site is under design by the private sector. It will include all information of Litani but still needs financial resources to implement. This stakeholder has recognized the urgent need to develop their IT capabilities by establishing a decision support system and a GIS. ONL is also developing the institutional database infrastructure for information. ONL is planning to get data on water demand and consumption from other stakeholder, as well as wastewater information and treatment plants data from the other three water establishments. This stakeholder has no problems to share data as long as it is compliant with the laws and regulations. ONL believes that in order to implement NWIS, the most efficient solution might be through the private sector, otherwise, ONL proposed to host the system since they are the most technically capable establishment to do so.

It is evident from the above that there is willingness on the behalf of all water establishments to carry out NWIS, but, the generation of much of the basic data such as the measurement of groundwater levels and production from the main source have to be done. Moreover, standard institutional procedures should be set for the generation and exchange of data between establishments. As the new institutional reorganization has been completed, the need for database systems and data exchange will arise and becomes more evident to the stakeholders, the opportunity should be utilized that the institutional organizational chart is still being developed and that NWIS should be integrated within that institutional setup.



## 1.4. Available water information types

In Lebanon, the following water information types exist at the stakeholders that were interviewed and some can be accessed through their web sites:

- Quantitative/maps
- Grey Literature
- Water Legislation/strategies

The call for papers/tenders, training/conferences, standards and best practices and innovative technologies types of information were not found or reported by any stakeholder. Although they might be available, they are not posted on their websites nor their internal systems (where systems are available).

Not all stakeholders interviewed shared all types of water data and information amongst themselves. The main information shared, however, is the quantitative and maps data. Subsequent to the launching or activities of the water establishments, NWIS will greatly assist to enhance the water information exchange procedures and set responsibilities of data collection and dissemination.

The following table shows examples of the different types of data that are available at the stakeholders

Stakeholder	Type of Information Available	Information status
<b>MEW/General Directorate of Hydraulic and Electric Resources (DoHER)</b>	<b>The Consultant could not assess the types of data available as they did not meet with the technical representatives of the department</b>	Not much data exists. Available data are yet to be computerized. There is some information on the GIS. Consultants have access to all water data by the public private partnerships
<b>General Directorate of Exploitation: (DoE)</b>	<ul style="list-style-type: none"> <li>- <b>Quantitative data:</b> -</li> <li>- Number of water consumers (on paper)</li> <li>- Administrative and budgetary information</li> <li>- Water quality analyses by Coordination Unit: sampling and (started recently to computerise data)</li> <li>- <b>Maps:</b> Expropriation maps (not directly related to water)</li> <li>- <b>Legislation,</b> e.g. Water Law 221 (2000), water regulations, well licensing</li> </ul>	<p>The Ministry has a web page through SEMIDE web page. The site became old, and MEW is in the process of entering updated data and information and entering news laws.</p> <p>DoE does not have a computerized system</p>
<b>Water Establishment of Beirut and Mount Lebanon (EEBML)</b>	<ul style="list-style-type: none"> <li>- <b>Quantitative Data;</b></li> <li>- Metadata of Springs, wells, dams</li> <li>- Discharge, salinisation in some sensitive wells</li> <li>- Water Quality (chlorination), Lab. central + each local office: tests chemical every 3 months and every month for bacteriological. 1200 Water Quality test results/month</li> <li>- Water production and consumption data</li> <li>- Billed water to customers</li> <li>- Monitoring discharge and supply for zones via telemetry connected to SQL server</li> </ul> <p><b>GIS and maps</b></p>	<p>Web site is available in Arabic</p> <p>Internet available but not used for information exchange</p> <p>Data is stored in ACCESS and a GIS linked to it.</p> <p>Customers' data will be linked with GIS in three months</p>

Stakeholder	Type of Information Available	Information status
	Digital maps containing networks, wells, springs, dams...etc)  <b>Web Site (Arabic)</b>	
<b>Water Establishment of South Lebanon (SLWE)</b>	<ul style="list-style-type: none"> <li>- <b>Quantitative Data:</b></li> <li>- Metadata of Springs, wells</li> <li>- Water production, consumption, and demand (rate of growth...etc)</li> <li>- Water quality (chemical and bacteriological)</li> <li>- Wells data</li> <li>- Infrastructure and asset registry</li> <li>-</li> <li>- <b>Maps:</b> Digital maps</li> </ul> <p><b>Others (on paper):</b> call for tenders, tariff, legislation, subscriptions</p>	Data stored in Excel sheets  Some difficulties to generate data since many data collected are estimates or have errors  No web site but is currently working on it include legislation and customers bills  Developed a cost-recovery model on Excel and will develop a financial accounting system entailing lots of water balance data
<b>Water Establishment of North Lebanon (EELN)</b>	<ul style="list-style-type: none"> <li>- <b>Quantitative Data:</b></li> <li>- Survey on metadata of springs and wells</li> <li>- Water production (estimated), consumption</li> <li>- Water Quality performance indicators</li> <li>- Estimates on water production, depending on the pump capacity.</li> <li>- Irrigation: (no reliable information).</li> <li>- Billing system in under Excel (in Arabic)</li> </ul> <p><b>GIS</b></p> <ul style="list-style-type: none"> <li>- Some network maps are existing on GIS (Tripoli and Kura)</li> <li>-</li> </ul> <p><b>Others (on paper):</b> documentation</p>	Data is either under computer or on paper  No computerised system available except for some Excel sheets and GIS for mapping. Computerisation of data is on going.  A Decision Support unit (DSU) is being developed. It will collect information
<b>Establishment of the Bekaa (Litani River Authority, ONL)</b>	<p><b>Quantitative Data</b></p> <ul style="list-style-type: none"> <li>- Measurement of main rivers weekly flows and springs through (55 gauges)</li> <li>- Some rain gauges for Litani Basin only.</li> <li>- Water quality (Litani upper Basin) – telemetry system</li> <li>- Metadata of Springs, wells, dams</li> <li>- Irrigation projects (by SCADA) for flow and supply)</li> <li>- Flood forecasting data (by portable meters)</li> </ul> <p><b>GIS (maps)</b></p> <p><b>Web site</b> already designed but not public</p> <p><b>Others</b></p> <p><b>Grey literature:</b></p> <ul style="list-style-type: none"> <li>- Library on the server:</li> <li>- Feasibility studies (by Studies Division)</li> </ul>	Data and information is stored in a central location in Beirut and is accessed through the country by means of a client server application.  Intranet system existing and they exchange data through it  Internet Link available for all the staff

## 2. ANALYSES OF DATA

### 2.1. Stakeholder analysis

#### 2.1.1 Stakeholder analysis matrix

Stakeholder and basic characteristics	Interests and how affected by NWIS	Capacity and motivation to establish a NWIS	Possible actions to address the Stakeholder needs	EMWIS awareness	URL <a href="http://www.w">http://www.w</a> .
<p><b>General Directorate of Hydraulic and Electric Resources (DoHER)</b></p> <p>This stakeholder is considered one of MEW three directorates. It is responsible for master planning a future vision, forecast and policy of water.</p> <p>NFP for EMWIS</p> <p>This directorate is currently working through the EU to embark on the measurement of groundwater levels (piezometric heads)</p>	<p>Need to enhance the information sharing and define roles and responsibilities</p> <p>Keen to implement a NWIS to exchange data and help in planning, negotiation and research.</p> <p>Depends on EMWIS to get regional water data to help in water negotiations</p>	<p>Advices that NWIS study be applied on one stakeholder (e.g. EEBML) as a pilot study before applying to the others</p> <p>Is not technically and financially capable to implement NWIS</p>	<p>Get decision makers' approval to move forward with the implementation of NWIS.</p> <p>Support NWIS initiative technically and financially</p> <p>Collect more basic data especially on water resources</p> <p>Encourage the data exchange especially after the new organizational restructuring</p> <p>Demonstrate NWIS success stories in other countries (e.g. Algeria) and transfer the lessons learnt to shorten the improvement time.</p>	<p>Stakeholder is aware of EMWIS</p>	<p>No web site for the MEW/DoHER except under the EMWIS site</p> <p><a href="http://www.emwis-lb.org/EN/Institutions/ministry_if_energy_and_water.htm">http://www.emwis-lb.org/EN/Institutions/ministry_if_energy_and_water.htm</a></p>
<p><b>General Directorate of Exploitation: (DoE)</b></p> <p>One of the MEW directorates.</p> <p>NFP for EMWIS.</p> <p>The main responsibilities of MEW/DoE lay in the supervision of the four newly reorganized public establishments working in the water sector.</p> <p>Ensures the administrative and financial control of these organizations and to issue of tender documents and specifications</p>	<p>NWIS is needed since stakeholder will start to exchange with the four newly formed establishments information on water production, wastewater, water consumption, and irrigation quantities.</p>	<p>Has no computerised water information system and it is in need to establish a database.</p> <p>Starting to computerize water quality and wants to be transparent when providing water information through NWIS</p> <p>NWIS begins as a local system in DoE, becomes public once political approval from the Minister is obtained</p> <p>Is not technically and financially capable to implement NWIS</p>	<p>Support the computerization effort in the directorate</p> <p>Work out the SOPs for data exchange between the stakeholder and demonstrate the importance of sharing data</p> <p>Demonstrate NWIS success stories in other countries (e.g. Algeria) and transfer the lessons learnt to shorten the improvement time.</p> <p>Support NWIS initiative technically and financially</p>	<p>Stakeholder is aware of EMWIS</p>	<p>No web site exists for this directorate</p> <p>DoE is in the process of updating the web site that is on the SEMIDE web page.</p>

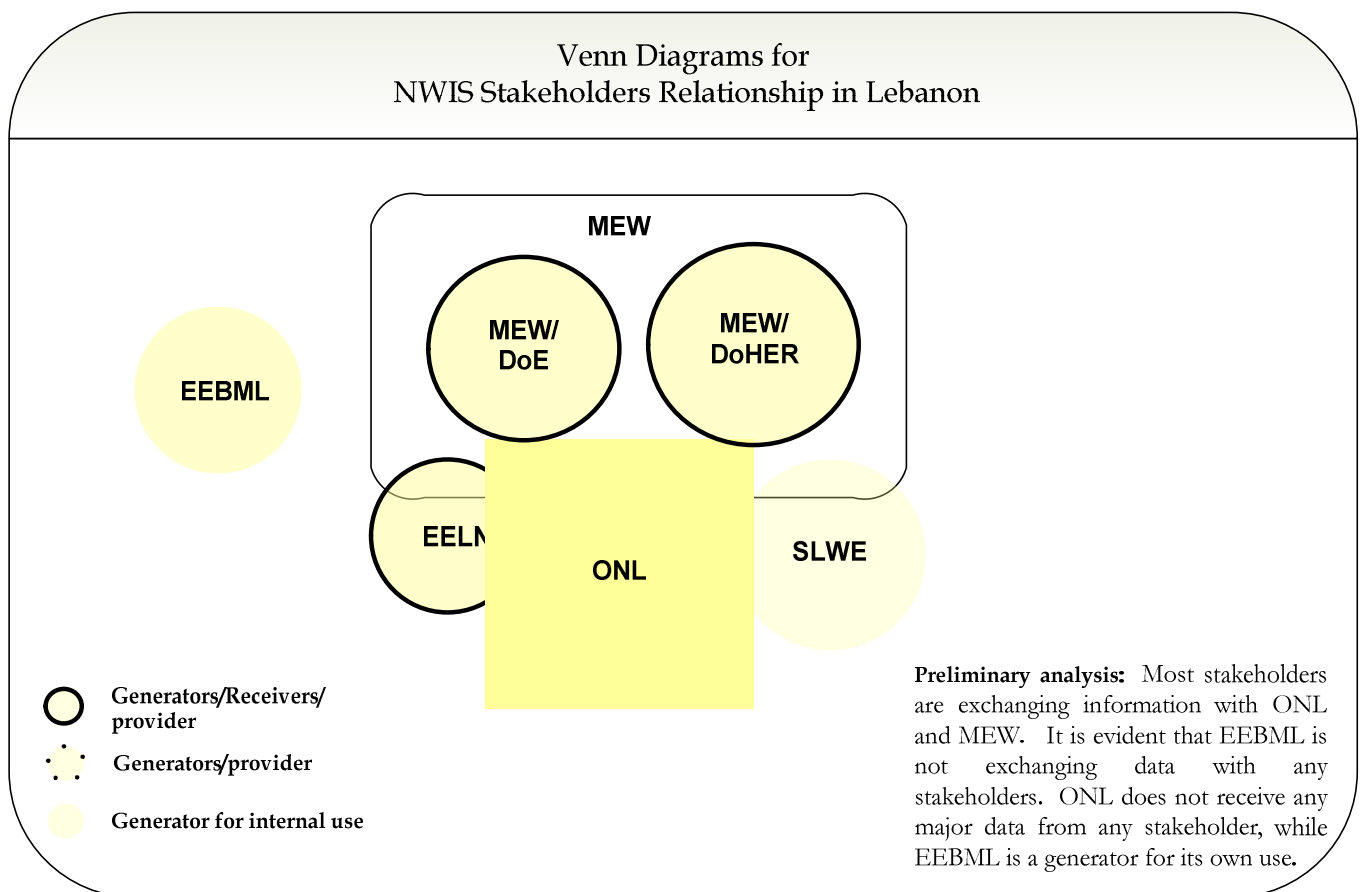
Stakeholder and basic characteristics	Interests and how affected by NWIS	Capacity and motivation to establish a NWIS	Possible actions to address the Stakeholder needs	EMWIS awareness	URL <a href="http://www.">http://w ww.</a>
<p><b>Water Establishment of Beirut and Mount Lebanon (EEBML)</b></p> <p>It is responsible for the water supply to Beirut city and villages in Mount Lebanon.</p> <p>Has metadata of springs, wells and dams within its jurisdiction.</p> <p>Has the water production and the amounts billed to customers.</p> <p>It monitors the discharge and supply into the supply zones through telemetry</p>	<p>EEBML is currently improving their IT systems and building the staff IT capacity of as they are developing a new IT section.</p> <p>EEBML is interested in NWIS and can integrate it within its improvement plans</p> <p>EEBML needs to improve its information exchange between stakeholders and believes NWIS will enhance that target</p>	<p>Staff need further training in IT</p> <p>Is not currently technically and financially capable to act as a backend to NWIS</p>	<p>Ensuring that EEBML gets the funds to enhance its IT infrastructure and human resource capabilities</p> <p>Encourage the information exchange procedures between stakeholders</p> <p>Define SOPs for information exchange</p> <p>Exchange the different knowledge and experiences of the water establishments in Lebanon between themselves</p> <p>Support NWIS initiative technically and financially</p>	<p>No previous knowledge of EMWIS nor NWIS an awareness campaign by EMWIS is recommended</p>	<p><a href="http://www.waterofbeirut.gov.lb">http://www .waterofbeir ut.gov.lb</a></p> <p>A web site exists but is in Arabic.</p>
<p><b>Water Establishment of South Lebanon (SLWE)</b></p> <p>Responsible for the supply of water and management of wastewater in the South of Lebanon and Nabatieh Governorates.</p> <p>Has meta data of well and springs, water production, consumption, and demand as well as water quality and infrastructure asset registry</p> <p>Stakeholder has already started to computerize their systems</p>	<p>Keen to improve their database system and sharing of data</p> <p>Stakeholder currently does not need any information from other stakeholder but provide to many other.</p>	<p>Experiencing a problem of lack of qualified staff</p> <p>Stakeholder is willing to share information on NWIS as long as it does not violate any law</p> <p>Is not technically and financially capable to act as a backend to NWIS</p>	<p>Ensuring that SLWE gets the funds to enhance its IT infrastructure and human resource capabilities</p> <p>Establishment of the envisioned NWIS.</p> <p>Define standard operation procedures to exchange information</p> <p>Exchange the different knowledge and experiences of the water establishments in Lebanon between themselves</p> <p>Support NWIS initiative technically and financially</p>	<p>No previous knowledge of EMWIS. An awareness campaign by EMWIS is recommended</p>	<p>Stakeholder has not web site</p>

Stakeholder and basic characteristics	Interests and how affected by NWIS	Capacity and motivation to establish a NWIS	Possible actions to address the Stakeholder needs	EMWIS awareness	URL <a href="http://www">http://www</a> .
<p><b>Water Establishment of North Lebanon (EELN)</b></p> <p>EELN is responsible for the water supply of North of Lebanon including around 50,000 customers in Tripoli and 11,000 customers in Koura.</p> <p>Do not have reliable information on irrigation in the north.</p> <p>Currently the use of computers is minimal but is undergoing computerization of their data.</p>	<p>The need for NWIS is highly recognized but it has to happen after the completion of data collection and computerization process of water information</p> <p>Need to improve coordination issues between government water establishments.</p>	<p>Understands the importance of NWIS.</p> <p>Is not technically and financially capable to implement NWIS</p> <p>Recently established a decision support unit (DSU) is being developed with the main responsibility to collect and verify data.</p> <p>Need to organize their data and have easy access to information</p>	<p>Exchange the different knowledge and experiences of the water establishments in Lebanon between themselves</p> <p>Enhance the coordination between donor agencies that are currently working to improve the IT capabilities for all water establishments in Lebanon</p> <p>Define standard operation procedures to exchange information</p> <p>Support NWIS initiative technically and financially</p> <p>Still lots of improvement on Identification of sources Data collection Computer infrastructure</p>	<p>No previous knowledge of EMWIS. An awareness campaign by EMWIS is recommended</p>	<p>EELN does not have a web site and there is no internet access to the staff</p>
<p><b>Establishment of the Bekaa (Litani River Authority, ONL)</b></p> <p>Originally established in 1955 to exploit Litani River, store, produce hydro-electricity, and operate irrigation. It is presently in charge of the irrigation system in the South and Bekaa.</p> <p>ONL is also considered the bulk water supplier for the South Lebanon Water Establishment.</p> <p>ONL uses SCADA system for irrigation control.</p>	<p>NWIS will greatly enhance their access to the data and facilitate the exchange of information between stakeholders</p>	<p>Understands the importance of NWIS.</p> <p>Is not technically and financially capable to implement NWIS</p> <p>Stakeholder feel that they are the most technically ready to host and run NWIS</p>	<p>Exchange the different knowledge and experiences of the water establishments in Lebanon between themselves</p> <p>Enhance the coordination between donor agencies that are currently working to improve the IT capabilities for all water establishments in Lebanon</p> <p>Define standard operation procedures to exchange information</p> <p>Support NWIS initiative technically and financially</p>	<p>No previous knowledge about EMWIS or NWIS. An awareness campaign by EMWIS is recommended</p>	<p>No web site exists for ONL</p> <p>The web site is already designed but still not public.</p>

## 2.1.2 Relationships between stakeholders

Venn diagram of stakeholders below demonstrates the following:

- Relationships between stakeholders
- Relative power and influence of stakeholders regarding water information (indicated by the size of shape). It was determined based on five criteria:
  - Type of relationship with stakeholders
  - Number of different information types that they deal with
  - Availability of functional core systems that they maintain
  - Willingness to share information
  - Number of the different types of information users
- The spatial separation is to indicate the relative strength or weaknesses of the working relationship between stakeholders
- The shape is indicative of the type of stakeholder. (Whether information provider or user)



- From Venn Diagrams, it is evident that all stakeholders met are data generators. The five stakeholders exchange water information amongst each other. The EEBML does not currently share any data with any other stakeholder. This is soon expected to change. The

ONL is the most influential stakeholder as far as the technological setup and the number of stakeholders they share data with.

### 2.1.2.1 Relationship between stakeholders

For the six stakeholders that the consultants interviewed, the following table defines the relationships between them:

Stakeholder	Type	Provides information to	Receives information from
<b>General Directorate of Hydraulic and Electric Resources (DoHER)</b>	Generator/Receivers Provider to other stakeholders' internal and public use	(meeting was conducted with the general director and no data was given on this subject, therefore, it could not be fully analyzed) - Water Establishment of Beirut and Mount Lebanon (EEBML) - Water Establishment of South Lebanon (SLWE) - Water Establishment of North Lebanon (EELN) - Establishment of the Bekaa (Litani River Authority, ONL)	(meeting was conducted with the general director and no data was given on this subject, therefore, it could not be fully analyzed) - Establishment of the Bekaa (Litani River Authority, ONL) - Water Establishment of South Lebanon (SLWE) - Water Establishment of North Lebanon (EELN)
<b>General Directorate of Exploitation: (DoE)</b>	Generator/Receivers Provider to other stakeholders' internal and public use	- Individuals, International bodies - Ministry of Public Works, - Ministry of Health - Universities - CNRS - Public	- Ministry of Health (WQ) - Council for Development and Reconstruction - The Council of the South - Ministry of education - Ministry of Environment - Private sector - Parliament
<b>Water Establishment of Beirut and Mount Lebanon (EEBML)</b>	Generator Not a provider to other stakeholders' internal nor public use	Do not exchange data	Do not exchange data
<b>Water Establishment of South Lebanon (SLWE)</b>	Generator Provider to other stakeholders' internal and public use	- Ministry of Energy and Water - Council of the South - Council for Development and Reconstruction - Ministry of Health - Parliament - Private sector, students - Public	- No acquisition of data from other stakeholders
<b>Water Establishment of North Lebanon (EELN)</b>	Generator/ Receivers Provider to other stakeholders' internal and public use	- Ministry of Energy and Water - Universities - Municipalities	- Ministry of Water and Energy - CDR - Litani Authority and other water establishments
<b>Establishment of the Bekaa (Litani River Authority, ONL)</b>	Generator Provider to other stakeholders' internal and public use	- Ministry of Energy and Water - Water Establishment of Beirut and Mount Lebanon (EEBML) - Water Establishment of South Lebanon (SLWE) - Water Establishment of North Lebanon (EELN) - Ministry of Health - Ministry of Public Works (maximum flow of rivers and wadis for culvert design) - Universities - Ministry of Environment - Ministry of Defence	- No acquisition of data from other stakeholders

### 2.1.2.2 Stakeholders relationship with NFP

The relationships of the stakeholders with the National Focal Point NFP (MEW) in Lebanon are considered to be good since all four newly developed establishments are supervised by MEW. Although, in Lebanon, the exchange of water information between all stakeholders is not very good, it is starting to change especially after the reorganization of the water sector. The need to share and exchange data will definitely arise as a main priority, not only within the MEW, but also between all stakeholders and eventually may be to the public after getting the necessary political approvals.

### 2.1.3 Assessment of NFP to coordinate and supervise hosting of NWIS

This subsection objectively assesses the capabilities of the MEW to act as a coordinator and as a supervisor for hosting the NWIS system. The following were the criteria used for the analysis:

- Human Resources- Technical skills
- Financial capability to manage NWIS system
- Acceptance by other Stakeholders.
- Political Mandate
- Infrastructure
- Availability of links with other stakeholders
- Availability of a core system to build on
- Level of ownership of data

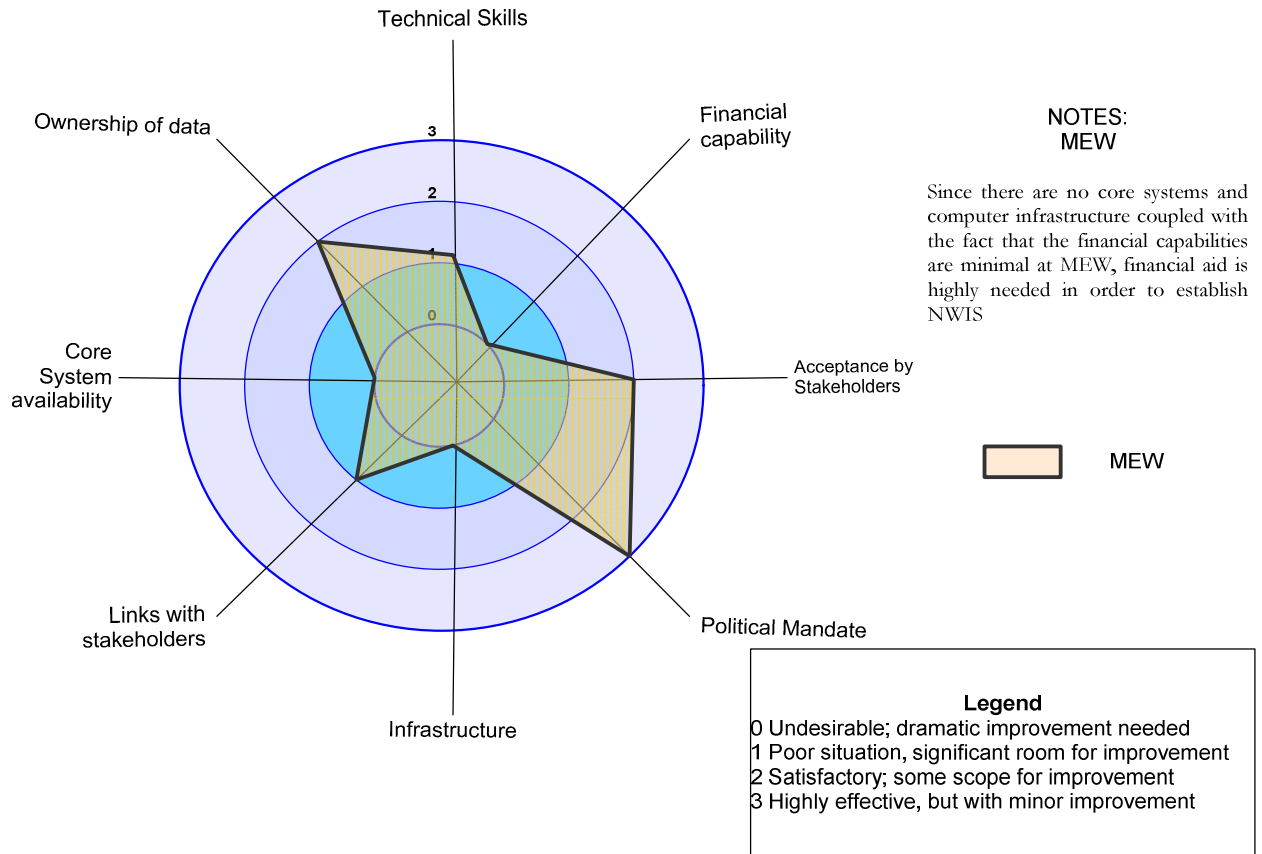
The table below numerically assesses these capabilities by assigning numbers or scores to each of the criterion based on the questionnaires that were filled from the stakeholders.

Criterion	MEW/NFP
Technical Skills	Score 1 The technical capabilities of MEW's staff on computer needs lots of capacity building and training
Financial Capabilities	Score 0 Currently there are no funds at MWE, and it was clearly indicated that the support for computer enhancement and the establishment of NWIS needs to be a grant.
Acceptance by stakeholders	Score 2 Relationship of the NFP with stakeholders within MEW seems to be good. However, the exchange of data with stakeholders outside MEW was not assessed because the Team did not meet with them. Moreover, as the new offices have their full autonomy and the obligation of reporting/providing data to the MEW should be strengthened
Political mandate	Score 3 It is within the political mandate of MEW to host and manage water data and share it with the others
Infrastructure	Score 0 The currently available networking and computer infrastructure are weak to non-existent. NWIS need to be established from scratch
Links with SHs	Score 1 MEW has links with some stakeholders; not all departments exchange data with MEW.
Core System Availability	Score 0 MEW has no core systems suitable for hosting NWIS.
Ownership of data	Score 2 MEW through its water establishments owns most of the water-related information since it is generating the majority of it.



The spider diagram below shows a graphical visualization of the assessment of capabilities of Lebanon; EMWIS NFP and proposed NWIS NFP.

### Spider Diagram of organizational capacity of NFP in Lebanon



All eight criteria were assessed for the NFP. Most criteria were not effective with the exception of “Acceptance by Stakeholders” and “Political Mandate”. It should be noted that the financial support is highly needed in order for MEW to establish NWIS. Core IT systems and human resources are considered to be non-existent.

## 2.2. NWIS analysis

### 2.2.1 SWOT for establishing NWIS

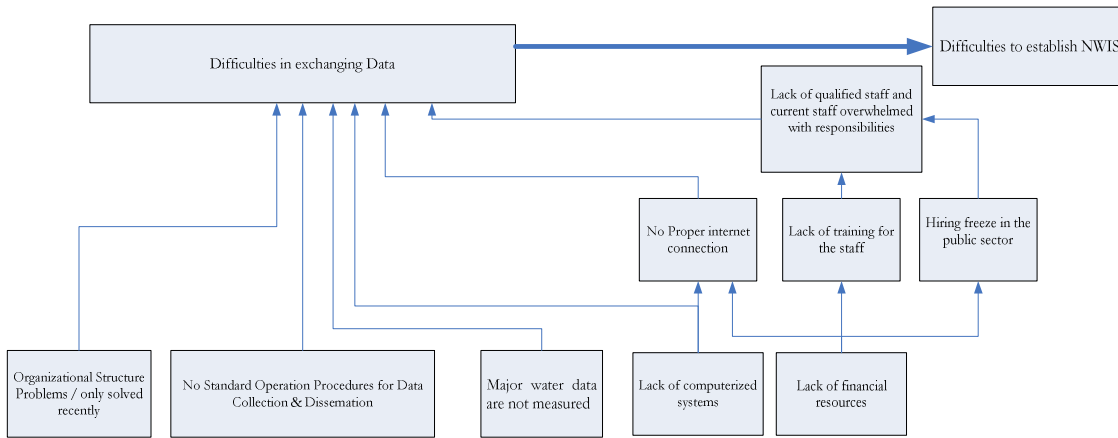
The table below shows SWOT analysis for establishing NWIS in Lebanon

Strength	Weaknesses
<ul style="list-style-type: none"> <li>• Some stakeholders recognize the importance of NWIS</li> <li>• Political readiness to go forward with NWIS</li> <li>• Availability and familiarity of GIS systems among many stakeholders</li> <li>• Private sector has the know-how to develop NWIS</li> </ul>	<ul style="list-style-type: none"> <li>• Non-existing exchange of data between some stakeholders that should be sharing data</li> <li>• No SOPs for data exchange.</li> <li>• Major water sources are not monitored (i.e water levels and customers consumption)</li> <li>• Weak computer infrastructure and lack of computerized systems to host NWIS.</li> <li>• No Internet or slow connections</li> <li>• Stakeholders do not have enough staff to develop and upgrade the computer systems</li> <li>• No financial resources</li> <li>• Lack of coordination between stakeholders</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• New restructuring opens the door to integrate NWIS as part of their new plans as the new setup necessitates the exchange of data.</li> <li>• Stakeholders showed interest and willingness</li> <li>• Concurrent donor project like IPP and FAS of the USAID and EU are working to upgrade the computer systems for the exchange and collection of data.</li> <li>• MEW recognizes the importance of exchange of data even on the regional level</li> <li>• Starting from scratch in stakeholders' establishments gives the opportunity to use a unified latest-technology system which integrates all their information</li> </ul>	<ul style="list-style-type: none"> <li>• No political level is granted</li> <li>• Lack of financial resources</li> <li>• Continuation of the current hiring freeze of personnel in the public sector</li> <li>• Some stakeholders don't see the benefits of NWIS</li> <li>• The new water sector institutional setup does not work</li> <li>• Political situation</li> <li>• Overlapping and non-compatible systems set-up by each stakeholder</li> </ul>

## 2.2.2 Problem tree analysis

Problems and obstacles leading to difficulties in exchanging reliable water data and difficulties to establish a NWIS in Lebanon were analyzed and represented in the problem tree shown in the figure below.

**Problem Tree Analysis for Water Information in Lebanon**

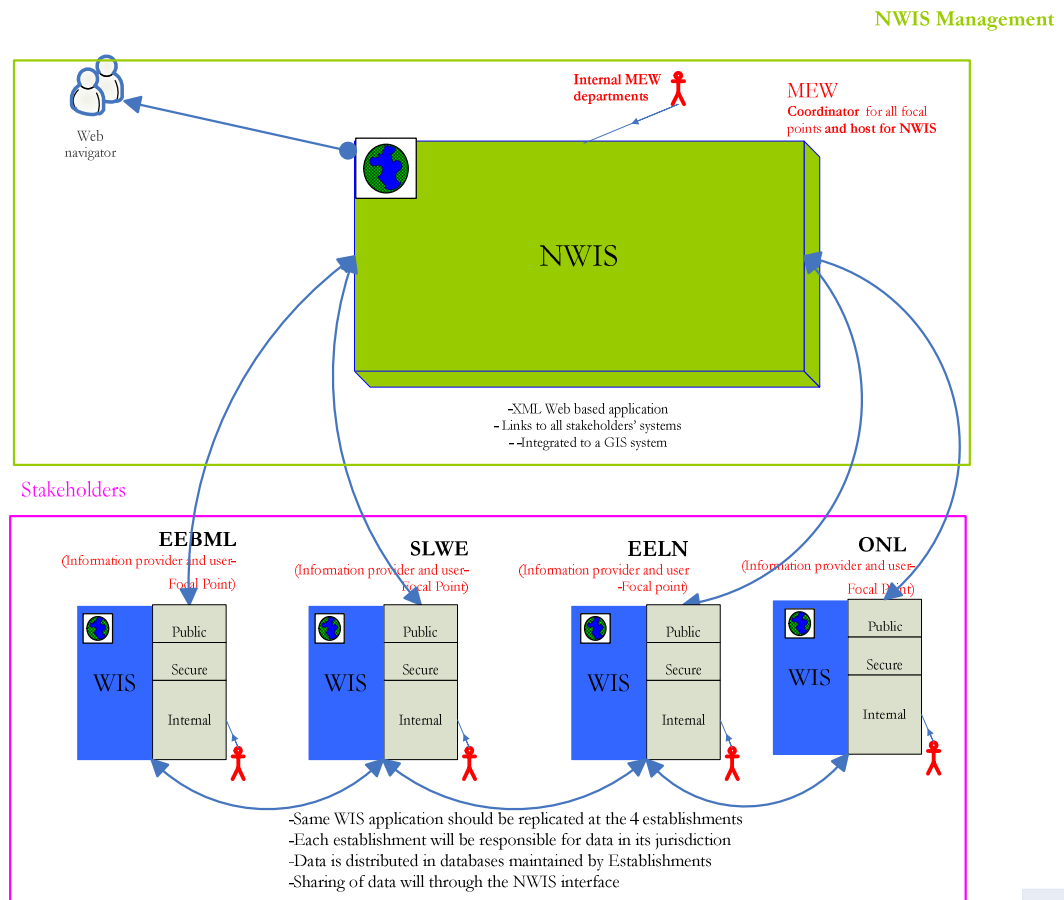


### 3. PROPOSED NWIS

#### 3.1. Envisioned NWIS in Lebanon

In Lebanon, it is still early to fully envision a NWIS. Priority should be given to setting up data collection and exchange procedures, institutionalization of these procedures, collecting the data and then an automated solution can be envisioned. The figure below shows a general conceptual design for a NWIS in Lebanon. The main participants of NWIS are proposed to be all the water authorities in Lebanon. It is also recommended that MEW act as the coordinator and host of the NWIS system but after qualified staff are appointed to follow-up and manage the system. It is also proposed that all stakeholders met should coordinate and unify their efforts to adopt one Water Information System at their establishments since they all have same responsibilities but in different geographical areas in Lebanon and would have the same needs. The WIS system proposed for the new establishments should be a web-based application with distributed databases maintained regularly by stakeholders.

Envisioned NWIS in Lebanon



### **3.2. Road map for implementation**

To develop a NWIS in Lebanon, two stages are recommended. They are;

- Pre-NWIS stage
- Development of NWIS stage

The following steps are recommended for each stage

#### **Pre-NWIS Development Stage**

1. Complete survey of all water supply sources
2. Measure water sources that are not currently measured and establish water resources monitoring departments where applicable
3. Ensure that data exchange is performed with all stakeholders that need the data
4. Develop standard operation procedures for the exchange of data between stakeholders
5. Ensure coordination between donor projects by creating a coordination committee
6. Support the computerization and development of databases
7. Obtain the political decision to hire more qualified staff
8. Fill in the vacant position in the organization structure
9. Develop specialized data collection and IT departments within each stakeholder
10. Support the installation of internet for every stakeholder
11. Develop and implement the web site for ever stakeholder

#### **Development of NWIS Stage**

1. Conduct an awareness campaign to demonstrate further the benefits of NWIS and transfer other countries' successful stories about NWIS (e.g. Algeria)
2. Get decision makers approval to move forward with the implementation of NWIS.
3. Set up an NWIS committee. This committee will ease the process of sharing water resources information and will set the road to establish NWIS.
4. The committee should finalise the overall NWIS concept
5. Get funds for NWIS development
6. Conduct a detailed study for the technical design of NWIS.
7. Develop the NWIS systems and its stakeholders' components

### 3.3. Cost estimates

It is clear that reaching the ultimate goal of developing a National Water information system in Lebanon needs collaboration and upgrading or developing information systems for all stakeholders. Cost estimates for upgrading or developing new systems for stakeholders is beyond the scope of this study.

For developing the NWIS, the following is required; some of these requirements need detailed design of the system in order to evaluate their cost.

No	Item required	Details	Estimated cost (Euro) That needs financing	In kind (Euro)
1	Detailed design study	Coordinator (1)  Office facilities & running costs  Conduct a detailed study for the technical design of NWIS	20,000 for the first and 20,000 for the second year   70,000 for the first year	10,000
2	Training	Training of staff.	10,000	
3	Equipment for hosting System	Web server, Database server for secure section, Backup DB Server	12,000 (if Intel based servers are to be used)	
4	Software for NWIS	<ul style="list-style-type: none"> <li>OS and Database software licences</li> <li>GIS</li> </ul>	<p>Anticipated initial costs will RANGE from 30,000 to 80,000</p> <p>However, the detailed study is needed to determine the features of the database to be used. Many factors determine what type of license is needed especially the availability of some licenses at stakeholders already.</p> <p>Anticipated initial costs will RANGE from 40,000 to 75,000</p> <p>However the detailed design study will determine what the exact cost of software licenses is and what the cost of development is especially that some stakeholders already have GIS licenses</p>	
5	Cost of software development	If software development is outsourced	Anticipated initial cost will be around <b>90,000</b> ; the detailed design study would give a more accurate number which is dependent on many factors especially if this item is to be outsourced.	
	Total for year 1	Cost of detailed study+ cost of training+ offices+ coordination	100,000	10,000
	Total for year 2	Cost of hardware +software licenses + development+ offices	From 172,000 to 257,000	10,000
	Annual Total after year 2	Coordinator + offices		30,000

## 4. CONCLUSIONS & RECOMMENDATIONS

### 4.1. Conclusions

The country consultations in Lebanon were successful. The main findings from the Lebanon consultation visit are the followings:

- Main stakeholders in Lebanon are; DoHER, DoE, EEB, EEBML, SLWE, EELN, and ONL
- Stakeholders met were all part of MEW. More stakeholders were mentioned in the interviews and may be selected, at a later stage, to join NWIS
- Stakeholders met in Lebanon are interested to establish NWIS on the National level, and some stakeholders are even interested to share some data on the regional level.
- Sharing of data with the public level needs political approvals.
- There are still major gaps in the data record in Lebanon. Major sources need to be measured and monitored.
- In Lebanon, and due to the newly developed institutional restructuring, the need to exchange water data has just started to emerge. The stakeholders interviewed need to implement their new institutional responsibilities and mainly to collect and store information in databases prior to the establishment of NWIS. This can also be viewed as an advantage since every stakeholder can integrate the NWIS concept as they develop their systems.
- Subsequent to the development of NWIS, the following are prerequisites to establishing NWIS;
  - o Collection of major water data
  - o Establish the exchange of data between stakeholders
  - o Set up SOPs for the collection and exchange of data
  - o Prepare the infrastructure for the storage and exchange of information by establishing database computer systems, internet connectivity, intranet links and web sites
- Once the procedures have been set for collection, storage and exchange of data, NWIS implementation can commence. The main obstacles for implementing NWIS in Lebanon can be:
  - o Failure to get political decision to establish NWIS
  - o Lack of financial resources to improve and upgrade stakeholders' information systems
  - o Unavailability of staff and vacant import positions due to the hiring freeze
  - o Delays and problems (if any) in the implementation of the new institutional setup
  - o Unavailable and unreliable data
  - o Unawareness of the full benefits of NWIS over the manual systems
- Opportunities were outlined for the establishment of NWIS in Lebanon, despite the numerous weaknesses and threats that exist. These opportunities are;

- Stakeholders showed interest in NWIS and asked to see a successful NWIS implementation in other countries
- New restructuring opens the door to integrate NWIS as part of their new plans as the new setup necessitates the exchange of data.
- Concurrent donor project like IPP and FAS of the USAID and EU are working to upgrade the computer systems for the exchange and collection of data.
- MEW recognizes the importance of exchange of data even on the regional level

## 4.2. Recommendations

- The need for NWIS in Lebanon has been clearly indicated especially after the recent restructuring of water sector and the development of the new water establishments. It is recommend to go forward in NWIS implementation in Lebanon
- Two stages are recommended in order to establish NWIS in Lebanon. They are the pre-NWIS preparation stage and the NWIS development stage. The most important steps in the preparation stage are the collection and monitoring of major water sources (i.e. water levels and production flows)
- Establish the institutional mechanism to ensure the proper coordination between stakeholders since they are considered opportunities to enhance and upgrade the information storage and exchange. Currently there are duplication of efforts which is creating inefficiencies in the development of automation systems for water information
- In order to reduce the period of time needed for development and upgrade of the stakeholders' IT capabilities in Lebanon, demonstration and learning from other countries success and failure stories might prove beneficial
- A major step toward the implementation of NWIS in Lebanon, is the competition of web site and establishment of internet connectivity



## **5. ANNEXES**

**ANNEX A - QUESTIONNAIRES FILLED DURING COUNTRY VISIT**

**ANNEX B - MINUTES OF FOCUS GROUP MEETING**