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Dutch Risk Reduction Team:
Reducing the risk of water related disasters

DRR-Team Scoping Mission Report

Lebanon

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DRR-Team Scoping Mission Report
Water management and water scarcity in Lebanon

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EXECUTIVE SUMMARY

At the request of the Lebanese Ministry of Energy and Water the Dutch Risk Reduction team fielded a one week mission to Lebanon to make an assessment of the water sector against the background of water scarcity, which was coming strongly to the forefront in the summer of 2014, and the influx of refugees due to the Syrian crisis. The mission was asked to formulate recommendations for the Lebanese government and to identify fields where the Dutch water sector could provide specific value.

Between 22 and 27 September the mission had a series of meetings with representatives of Lebanese authorities, IFIs and donors and NGOs and it paid a one day visit to the Bekaa valley. Meetings were organised by the Netherlands Embassy and the week was concluded by a presentation of preliminary findings to the main discussion partners at the residence of the Netherlands ambassador.

The main conclusion of the mission is that the overall stagnation in Lebanese politics is preventing the development of adequate responses to the needs in the water sector, including those related to water scarcity. General water sector strategies, policies and institutions are in place but the political steps needed for effective implementation are not undertaken. An example is the time it takes to adopt a new Water Code. There is no critical lack of expertise in the water sector and the main issues have been well analyzed and documented by the sector and by IFIs, donors and other international partners.

Regional Water Establishments have been created as the service providers for drinking water, waste water treatment and irrigation. It is important that these establishments will be allowed to develop further towards entities that can operate autonomously with the application of user pays principles.

The availability of reliable data is an issue that is seriously hampering the development and implementation of adequate policies. Initiatives as the development of a Water Atlas by the Ministry of Energy and Water and the establishment of a Water Centre for Training and Information are steps to address these issues. It is recommended to make a start with annual or bi-annual reports on trends in water resources, service delivery and progress in the implementation of strategies and investment plans.

Increasing water storage capacity is a very practical way to increase water security. The National Water Sector Strategy includes an ambitious plan for the further construction of dams. A revised priority setting including further evaluation of risks and financing, might expedite the implementation of the storage dams programme. It is also recommended to further explore smaller scale interventions that will increase storage for less costs and which might be easier to implement.

The introduction of modern irrigation in the rural areas is quite successful on the modern farms and should be facilitated and encouraged further. Modern irrigation systems without the knowledge when to irrigate and how much to irrigate does not increase the water efficiency, however. Due attention is to be paid to effective extension services.

In general, increasing awareness and changing the attitude towards water as a precious public good is a prerequisite for the implementation of effective policies in the Lebanese Water Sector.

The mission has looked into areas where the Netherlands water sector can be of specific value to the Lebanese water sector. Institutional strengthening of Water Establishments, industrial waste water treatment technologies, artificial recharge/small scale water storage and agricultural precision technologies are such areas in the view of the mission.

The Netherlands government has various "trade and aid" instruments to facilitate private sector investments, infrastructure development and public private partnerships that are of interest to the water sector. However, many of these instruments are restricted to selected countries and probably due to its income status Lebanon is not amongst these countries. From the mission's perspective the impact of water scarcity coupled with the impact of the Syrian crisis could be a ground for reconsideration.

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LIST OF ABBREVIATIONS

BML	(Water establishment for) Beirut and Mount Lebanon
CDR	Council for Development and Reconstruction
DRR	Dutch Risk Reduction
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
IFI	International Financing Institution
LARI	Lebanese Agricultural Research Institute
LSCTF	Lebanon Syrian Crisis Trust Fund
MoA	Ministry of Agriculture
MDTF	Multi-Donor Trust Fund
MoEW	Ministry of Energy and Water
NWSS	National Water Sector Strategy
O&M	Operation and Maintenance
PPP	Public Private Partnership
STP	Sewage Treatment Plant
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
WB	World Bank
WE	Water Establishment
WHO	World Health Organization
WSS	Water Supply and Sanitation

1 BACKGROUND

1.1 Water resources

This summer brought the issue of water scarcity to the front pages of the newspapers in Lebanon. After a winter with well below average rain and snowfall rivers ran dry, water levels in lakes dropped to record low levels and farmers and much of the population had to find ways to deal with daily shortages – often at considerable expenses and often at the cost of already heavily over-abstracted aquifers.

No one knows what the coming winter will bring. It might well be that it will bring plenty of rain and snow and that the situation will be more relaxed next year; it might also be that it will be another winter without much rain and snow.

In an average year Lebanon would be able to just manage. The 2012 National Water Sector Strategy estimated that in the year 2009 an amount of 926 m³/cap/year of renewable water resources was available, expecting that this would diminish to an average of 839 m³/cap/year in 2015. This is just below the threshold for water scarcity which is usually set at 1,000 m³ per person per day. Water scarcity is defined as the point where the demand by all sectors, including the environment, cannot be satisfied fully.

Climate change is expected to make the situation worse and to result in a considerable drop in the amount of available water resources. A rise with 1 degree Celsius is expected to reduce the available volumes with 6-8%, and a rise with 2 degrees Celsius is expected to reduce the available volumes with 12 – 16%. It is not only the volumes that will change, but also precipitation patterns with overall longer periods of drought and less for the already drier Bekaa valley.

The mass influx of Syrian refugees adds to the water stress. In May 2014 the UNHCR counted 1 million Syrian refugees and it estimates that the Syrian refugee population could reach 1.5 million by the end of the year – other estimates are even higher. This is an overall population increase of almost a third, and it is much higher in specific areas as the Bekaa. The Ministry of Environment estimates that this results in an overall increase in national water demand somewhere between 8 and 12 %. The Syrian crisis is not expected to be resolved any time soon.

1.2 Institutional setting

The Ministry of Electricity and Water (MoEW) is the central water authority at national level. It provides overall guidance to the water sector and it has produced the main guiding document - the 2012 National Water Sector Strategy (NWSS) which has been approved by the Council of Ministers. Law 221 (2000) delineates the main responsibilities. Other Ministries involved include the Ministry of Environment and the Ministry of Agriculture.

The Council for Development and Reconstruction (CDR) is Lebanon's main entity for public infrastructure investments. It manages the financing and construction of major water supply, wastewater and irrigation infrastructure, whereby management and ownership of structures is transferred to the appropriate authority once construction/commissioning is completed.

Four regional Water Establishments (WE) have been created for the planning, construction and operation of drinking water, waste water and irrigation systems on their territories. Next to these authorities the older Litani River Authority exists with a specific mandate for the Litani basin including irrigation and hydropower as well as a few specific tasks for the whole country. They all report to MoEW.

Municipalities play still an important role, particularly in water supply and wastewater, often managing assets and taking on functions as needed when other entities are not (yet) able to fulfil tasks for whatever reason.

Lebanon is classified as an upper middle income country, with a GDP (PPP) of 17170 USD/annum, which places it near countries as Romania and Turkey. Nevertheless is still attracts considerable support from donors and IFIs, partly due to the events of the last decades. Actively supporting Lebanon are the EU through its ENPI programme, France, the US (USAID), Italy and Switzerland. Development banks active in Lebanon include the World Bank, the EIB, KfW, AFD and the Arab Funds. Though donor assistance appears to become less, the country is able to secure large loans from IFIs for its infrastructure as the recent 474 MUSD World Bank loan for the Bisri dam project illustrates. The Syrian crisis, however, is generating new donor involvement for humanitarian assistance.

Knowledge, technical expertise and technical skills are generally speaking available in Lebanon. The country houses well reputed universities, including the American University of Beirut, that provide relevant civil engineering and science courses. Also many Lebanese take the opportunity to take an international (professional) education in especially France and the USA. Lebanese consultancy firms are well known in the water sector, operating both in their home market and in the wider region.

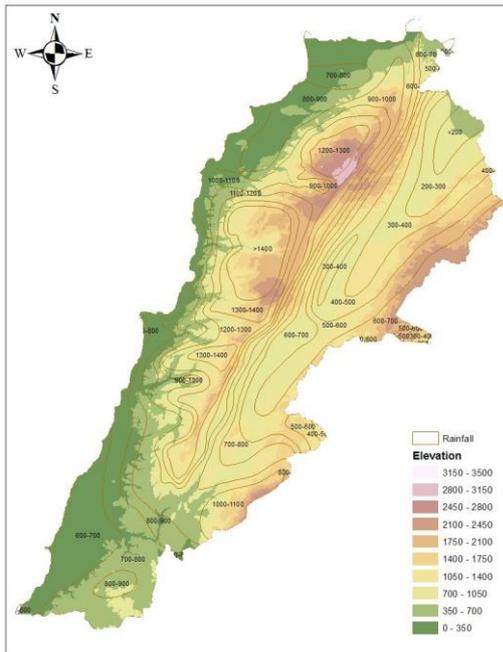
Lebanon has several (environmental) NGOs active in the water sector. Lebanon Eco Movement acts as an umbrella organisation for a number of them. Another role is being played by the Civic Influence Hub, which is a civil group that aims to overcome the political stalemate that hampers progress in rebuilding a modern Lebanon using economic-based ideas (Federative Economy). It has taken the modernization of the water sector on as its first project and it developed a White Paper/5 year plan for the Water Sector (Blue Gold), which has attracted much attention.

1.3 The agricultural sector in Lebanon

Agriculture is the most water-demanding sector in Lebanon – consuming about 70% of water resources.

Average precipitation in Lebanon is diverse. It ranges from less than 200 mm to more than 1,400 mm of rain per year. As a result, five distinct agro-climatic zones are present:

- (1) the coastal strip,
- (2) low and middle altitudes of Mount Lebanon,
- (3) west,
- (4) central and
- (5) north Bekaa.



Precipitation and topographic profile of Lebanon (Source: Climate change vulnerability and adaptation agriculture Lebanon's Second National Communication Ministry of Environment/UNDP 2011)

Lebanon has two types of agriculture. The first one is commercial agriculture, which is in general efficient, modern, and depending on adequate financial resources for investment and exploiting every profit possibility. This type of agriculture is practiced in around 35 thousand farming units and covers about 25% of total agricultural holdings. It is based on the integration of preproduction and post-production agricultural activities, and on openness to foreign markets (CDR plan for 2013).

The second type is an agriculture that is mainly devoted to the preservation of cultural and family heritage. It is practiced in small holdings with no investment or profit opportunities. It is considered as extra income and as subsistence agriculture. Most rural farmers practice this type of agriculture.

Agriculture contributes a small but relatively stable 6.4 percent average to the Lebanese GDP. Value added per square kilometre is higher than in many nearby countries, reflecting the higher intensity of production and larger focus on high value crops as fruit and vegetables. Overall economic importance is significantly less than in neighbouring countries, consistent with Lebanon's overall higher income and more urbanized and diversified economy.

Lebanon is a net food importer. Total agricultural and food imports amounted to 3181 MUSD while agricultural and food exports were valued at 581 MUSD. The country is highly vulnerable to price volatility of food and other agricultural commodities.

According to the most recent Agricultural Census (2010/11), the total agricultural area is estimated at roughly one-third of the total surface area (332 000 hectares). A total of 230 000 hectares is cultivated of which almost 50% is under irrigation. Land use in Lebanon has gradually shifted from production systems based on cereals towards high value-added crops (mainly fruits and vegetables). The livestock sector contributes around 30 percent of the total value of production.

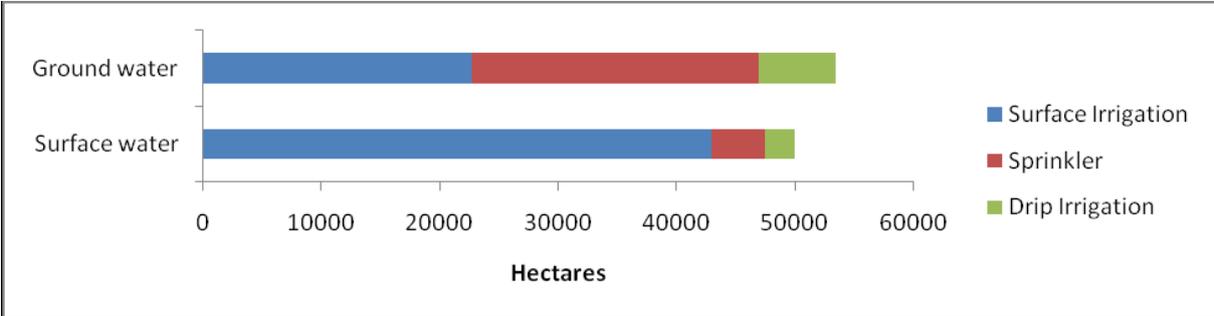
Approximately 20–25 percent of Lebanon's active population is involved in the agriculture sector, including full-time and part-time workers as well as seasonal family labour. The agricultural zones located in the Bekaa and northern Lebanon provinces cover 67 percent of the total agricultural land and it are typically larger commercial farms. In contrast, southern zones comprise smaller farmers, many of whom live in remote rural areas. Over 20 percent of heads of households engaged in the sector are very poor (FAO, 2012).

Topography is a determining factor for potential crop types and agricultural techniques. Other factors include the characteristics of soils, irrigation and water availability. The natural variations in elevation offer Lebanon the possibility of a diversified agriculture; from quasi-tropical products on coastal plains to orchards in high-altitude mountains, with a full range of possible intermediary crops in between. Physical configurations of terrains (vast plains, narrow plains, basins, slopes, etc.) determine the possibilities for automation or mechanization, industrial and semi-industrial exploitation (CDR, 2005).

On the coastal strip, tropical crops, citrus and horticulture crops are grown. On the lower altitudes, olive, grape and other Mediterranean crops are dominant. Temperate fruit orchards cover the middle altitudes, while field crops, grapes and fruit orchards are biggest in central and western Bekaa. Northern Bekaa with large marginal lands has few irrigated crops and rainfed cereals or fruit trees (FAO 2012). Half of the agriculture surface is irrigated, but only 2% of it is protected under greenhouses and plastic tunnels. Irrigated crops are mainly vegetables and fruit trees, whereas rainfed cropping deals mainly with olive trees, tobacco, cereals and legumes .

1.4 Irrigation

On average 70% of irrigation is through flooding and furrow irrigation and 30% of irrigation is sprinkler and drip. During the drought year 2014 the percentage of modern irrigation in groundwater dependent irrigated agriculture was reported to have increased till 80%. It is generally noted that sprinkler and drip irrigation are more commonly used when irrigation relies on groundwater and for specific crops such as potato, sugar beet and cereals.



Distribution of irrigated lands by source and irrigation technique used (Source: MoA/FAO, 2000 in MoE, 2001)

Current water demand in agriculture is estimated at 9,000 m³/ha/year. The NWSS aims at a reduction of this demand to 7,000 m³/ha/year. Tariffs for water in irrigation are reportedly 0.12 USD per m³ and a flat rate of 400 USD/ha.

Especially for the South and the Bekaa, the NWSS includes investments in irrigation infrastructure with an envisaged development of 31600 ha before 2020, and 31600 ha after 2020 at a total investment cost of 1040 MUSD.

Groundwater is monitored in 20 wells all over Lebanon. USAID (2010) tried to establish the groundwater balance for the Bekaa. They concluded that the recharge is 210 million m³/year and the outflow 260 million/year: a base flow to the Litani River of 130 million m³/year and groundwater use 130 million m³/year. According to LARI, the Lebanon Agricultural Research Institute, groundwater levels in Bekaa are on average dropping at a rate of 1.5 m/year.

Modern farmers in the Bekaa valley use Dutch technology (seed potatoes) and have good yields (more than 40 ton/ha for potato). The water scarcity has increased the cost of potato production with 30% to 750 USD/ha. Depending on the depth of the water modern farmers have reduced their irrigation gifts up to 50% (personal communication Abu Sawan, President Agricultural Syndicate).

To increase the available amount of water, the Ministry of Agriculture is carrying out the Green Plan that is promoting land reclamation and the construction of artificial hill lakes by local communities. Green Plan works with IFAD loans and is currently negotiating WB loans as well.



Potato yields of more than 40 tonnes/ha in the Bekaa valley

1.5 Wastewater collection and treatment

Over the years wastewater collection systems have gradually developed and expanded in urban areas. Network coverage is now at 60%.

Until recently wastewater collected was discharged directly in the sea, streams and rivers. In recent years several Sewage Treatment Plants (STPs) for cities in the coastal zone were realized with the intention to discharge only treated secondary effluents in the sea. In practice the development of networks and primary diversion lines to the STPs were not synchronized with the construction of the STPs, resulting in some new STPs standing idle. Actual treatment of wastewater now stands at approx. 8%.

An interesting case is the recently completed STP for Tripoli. A foreign operator has the contractual obligation for a three years O&M period after which the plant will formally come under the responsibility of the North Water Establishment for further exploitation of the plant.

In December 2010 the Ministry of Energy and Water published the "Strategy for the Wastewater Sector". This document presents a critical review of the current situation of the wastewater sector in Lebanon, with the main causes of the current situation. It further presents sector objectives and targets as well as five strategic initiatives.

The objectives of the wastewater sector are to collect and treat all wastewater according to the national standards and regional agreements and, where economically feasible, to reuse the treated wastewater for agriculture, industrial and amenity in line with national health and safety standards. Cost recovery will be based on the "polluter pays" principle.

The sector targets for the period 2011-2020, serving the projected population up to 2015-2030, are:

- Increase of the present wastewater collection (60%) and treatment (8%) to 80% collection and treatment by 2015, and 95% collection and treatment by 2020
- Pre-treatment of all industrial wastewater by 2020
- Increase reuse of treated effluent from zero percent in 2010 to 20% of treated wastewater by 2015, and of 50% by 2020
- Secondary treatment and reuse of all inland wastewater by 2020, and secondary treatment by 2020 of coastal wastewater where reuse is economically justified
- Full recovery of all O&M costs by 2020 following the "polluter pays" principle and full recovery for BOT projects

The NWSS estimates that over the period 2011-2020 the realization of these plans for water supply, wastewater and water resources management will require 7.74 billion USD in capital expenditures and 2.1 billion USD in operating expenditures.

The Ministry of Environment's "Policy Paper & Action Plan for Industrial Wastewater Management in Lebanon", dated November 2013, specifies that late 2013 8 STPs were operational, 6 completed but not yet operational, 4 under construction and 9 in the planning stage, adding up to a total of 27 STPs.

The document further specifies that the cost of environmental degradation was estimated at 3.7% of GDP in 2011. The largest contribution is attributed to water pollution, at 1.08% of GDP, which would amount to 648 MUSD for 2014.

Initial initiatives in industrial wastewater treatment were undertaken between 2011 and 2013 under guidance of the Ministry of Environment on a voluntary basis with financial support from the Environmental Fund for Lebanon. Six industrial enterprises subscribed under the Industrial Wastewater Management programme that aimed at meeting the Environmental Limit Values set by the Ministry of Environment for discharge of residual wastewater flows into the municipal wastewater network or into recipient surface water bodies.

The Policy Paper specifies that Lebanon counts 4033 large industrial establishments distributed over 15 sectors of which 10 are major sectors: food & beverage, furniture and other manufactured goods, other non-metallic mineral products, fabricated metal products, printed matter and recorded media, clothes and dyeing fur, chemicals and manmade fibres, rubber and plastic products, machinery and equipment, leather and leather products.

At present industries enjoy some sort of grace period. Environmental legislation such as the Environmental Code, defining policies, strategies, measures and obligations, is in place but enforcement is not yet implemented. New industries, however, do have to comply with various environmental laws such as Environmental Impact Assessment and Environmental Audits.

The Policy Paper further indicates that treatment/disposal of sludge of WWTPs adopting secondary treatment remains a challenge as state-of-the-art expertise and experience is currently not available in Lebanon.

A Report with ample information on the environmental water resources degradation, in particular for the Litani Basin is the EU funded Report on "Cost Assessment of Water Resources Degradation of the Litani Basin", published in December 2013.

1.6 Syrian influx

It is estimated that by the end of 2014 1.8 million refugees from Syria will have arrived in Lebanon. This is a staggering figure for the country if one realizes that this equals about a third of the Lebanese population.

Refugees can be found throughout the country, renting rooms and garages, housed in schools and other public buildings, and in informal (small) tented settlements. Not surprisingly given its proximity to the border, the Bekaa has a large share of this population. So far Lebanon has not set up massive refugee camps as in Jordan.

This huge increase puts considerable pressure upon the hosting communities and the country's resources, including its water resources. The September 2014 report "Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions" indicates that additional water demand from refugees will amount to 43-70Mm³ per annum and result in wastewater production of 34-56Mm³/annum. For the increased demand an investment

would be needed of over 1.3000 MUSD. It is being noticed that groundwater levels drop significantly. The report describes in detail the increase of water related diseases.

Public institutions have difficulties to cope with the extra demands, including an institution as WE Bekaa which is already under-resourced. Municipalities and communities sometimes have to take recourse to organising their own water supply and wastewater collection and treatment and/or diversion.

The Lebanese government is developing its response to this humanitarian challenge. UNHCR, donors and NGOs are also looking into ways to alleviate the situation for both the hosting communities and the displaced Syrians. Together with the World Bank and UN organisations a road map has been developed prioritizing needed interventions, whereby actions in the water and sanitation sector are aligned with the NWSS. The highest priority is given to the Northern and Bekaa regions where most of the refugees are located. It states that over 30 percent of households are without a public water connection. Further, more than 440 informal tented settlements and collective shelters in public buildings within host communities have inadequate temporary latrines. Most of these sites lie on flood plains and pose severe public health risks, particularly with the advent of the winter period.

Donors, including the Netherlands, are contributing to the Lebanon Syrian Crisis Trust Fund (LSCTF), which is managed by the World Bank. In Annex H an overview can be found of projects that have been proposed for financing, including water supply and wastewater projects.

2 DRR-TEAM MISSION

A Dutch Risk Reduction Team (DRR) of three experts visited Lebanon between 22 and 27 September 2014 at the request of the Lebanese Ministry of Energy and Water for a short assessment of the current situation in the Lebanese water sector and to provide advice on water management and scarcity issues against the background of the present water scarcity and the massive influx of people due to the Syrian crisis, and to scope opportunities for co-operation between the Dutch and Lebanese water sectors. The mission consisted of Winfried Pietersen (Team Leader), Jan Oomen (expert WS&S) and Koen Roest (expert Water and Agriculture)

The mission consisted of a series of meetings and discussions with the main actors in the Lebanese water sector including Ministries, Water Establishments, IFIs and donors, and civil society. A one day visit was paid to the Bekaa valley to gain more in-depth insights in the particular situation of that region. The programme of the mission is included in Annex C.

At the end of the mission preliminary findings were presented to the press, and presented and discussed with representatives from the institutions and organisations the mission had met that week. In the Netherlands a presentation was given to a selected number of firms and organisations active in areas that were identified by the mission as potentially promising for the Netherlands water sector.

The following contains an introductory sketch of the Lebanese water sector, the main observations made during the one-week mission and the main recommendations to the Lebanese government with regards to water management and water scarcity issues, and an identification of areas where the Dutch water sector could be of particular value to the Lebanese water sector. Annex E contains an overview of background documents that have been consulted during and after the mission as well as links to various relevant sites that have been consulted.

The Embassy of the Kingdom of the Netherlands in Beirut organised the visit, and facilitated and participated in its meetings.

3 OBSERVATIONS AND RECOMMENDATIONS

3.1 The overall legal and policy framework

It is obvious that Lebanon needs to take measures to become more resilient against droughts and to actually protect the resources it has. Investments in infrastructure and the development and implementation of effective water scarcity/demand policies are needed. The urgency is clear.

The NWSS is a comprehensive document that deals with the full water sector in a combination of analysis, policy statements and intentions, and outline investment plans. It is a good starting point for the further developments in the water sector. Parts will have to be elaborated further, be it investment plans or a policies, but it already has an important function as a guiding document. The NWSS seems to have wide support and it is taken as a reference in most of the studies and plans dealing with the Lebanese water sector.

The Water Code is already waiting for final approval and adoption for some time. It covers the main legal principles, the introduction of a National Water Council, the formulation and implementation of a National Water Master Plan for water and wastewater infrastructure, recognition of the administrative, environmental, economic and financial requirements for sustainable water resources management, and it sets the rules for Private Sector Participation. Its adoption is essential to implement the NWSS and the further development of the sector.

To outsiders it is somewhat difficult to comprehend that with a clear urgency and with so many elements in place so little progress is made in addressing water scarcity. A government approved sector strategy, a water law that only seems to be a few formalities away from approval and implementation, access to investment finance, in-country skills and capacities – it is all there. When inquiring what is hampering effective progress and implementation the answer that one gets is invariably politics – rooted in the desire and need to find and maintain balance between communities but that is nearly paralysing decision making at times. Other sectors are equally affected.

This lack of progress is eroding the water sector's credibility. IFIs, donors and international partners do not see the progress and reforms they are willing to invest in, and it has become a major issue in the considerations of at least some of Lebanon's international partners.

The development of the "Blue Gold" white paper can be seen a response to this situation. It has been developed by the Civic Influence Hub, which describes itself as a group of concerned citizens that feels the need to act to fill in the present policy and planning gaps. It has chosen the water sector as the first sector. Blue Gold aims to implement 40 innovative initiatives by 2030 to increase water supply, optimize water demand, ensure up-to-standard water quality, and improve water management efficiency, whilst at the same time setting up institutional and legal structures. It recommends 15 short term initiatives to be implemented by 2020 which is to result in a 500 Mm³ surplus at a cost of 5 billion USD – which is 2.4 billion USD less expensive than in the government's plans.

The plan has been formulated through a series of workshops and consultations with water sector experts and experts from the private sector. Its overall content stays close to the NWSS. Accelerated implementation of a number of measures and the creation of a new High Council consisting of government representatives as well as the private sector (including civil society) are the main elements. In the Blue Gold document the private sector is seen as the driver in implementation. The water establishments get little to no

attention. Blue Gold has been marketed professionally and its advocacy efforts have played an important role in bringing water scarcity and the overall needs of the water sector much higher on the agenda. It remains somewhat unclear, though, how practical implementation could take place. The impact of the Blue Gold document may gradually faint as different sentiments exist on the true drivers behind it.

It is imperative that steps are being taken to allow for further progress in the Lebanese water sector – the adoption of the Water Code and further elaboration of the NWSS are overdue.

3.2 Improvement of water supply and wastewater collection and treatment

Water Establishments are on paper the main operational entities in water supply, wastewater treatment and irrigation with a large degree of autonomy. The NWSS and the (draft) Water Code endorse the concept. In practice, however, the autonomy of WEs is rather restricted. They are not fully and solely responsible for their capital investments and operational funds, both in terms of acquisition as well as expenditure of these funds; they are not entitled to hire and fire staff as this is to be arranged in consultation with the Cabinet of Ministers, notwithstanding approved year plans and budgets. Major capital investment projects such as networks and treatment plants are the responsibility of CDR which hands over infrastructure to WEs after commissioning. Only then WEs become truly involved – being responsible for its management, operation and maintenance.

WEs have currently water tariffs that in most cases do not yet cover O&M costs, let alone costs for investments; these financial problems are compounded by a high Non-Revenue Water percentage and low bill collection efficiency. There is also a high number of illegal source points (wells and piped connections) not yet being subjected to billing. Charges for wastewater collection & treatment are well below O&M cost level.

At the same time it is reported that private water delivery business collects already 65% of total water expenditures of connected households (being compelled to purchase additional water from water trucks), and 75% of total water expenditures of unconnected households.

Financial constraints are seriously hampering service level improvements. The flat rates for customers remove the challenge for WEs to invest in service level improvements and at the same time it prevents the collection of financial resources for developing such improvements. Clients are not willing to pay higher monthly bills as long as services will not be improved and they will continue to buy expensive water from private vendors.

Longstanding permissive culture and practices complicate adequate management of water systems, implementation of instruments such as metered systems and related progressive water tariffs, appropriate billing for water supply and wastewater treatment for those with illegal water connections, and application of enforcements.

It seems that Lebanon has opted for a model where water distributed through the network doesn't necessarily comply with WHO guidelines as it is assumed that water delivered will be used "only" for general functions in the house but not for human consumption. When water resources would further deteriorate in quality and when existing water treatment (for groundwater usually limited to disinfection through chlorination) would not be upgraded, then health hazards could gradually develop for applications as cleaning and rinsing fresh vegetables and fruits before consumption as well as personal hygiene activities as showering, in particular for infants and children.

The new wastewater tariff (10-25% of the water supply bill at the initial stage), introduced from 2011 to pilot areas where all customers are connected to a sewer network and to a STP, may not be sufficient if full recovery of all O&M costs for water supply is to be reached by 2020. A maximum percentage of 50% of the water bill is mentioned.

Deteriorating quality of water resources due to large scale uncontrolled domestic, industrial and agricultural pollution caused by a severe backlog in wastewater collection and treatment as well as salt intrusion in aquifers during over-exploitation threaten the availability of adequate sources of drinking water and will certainly add to the costs WEs will have to make to deliver water to their customers.

It is recognized that the willingness to pay for adequate water services will only grow when the service levels improve. Households and other users are now having considerable costs to ensure the water they need. It is recommend to consistently implement further the user pays/polluter pays principle, whilst at the same time increase WEs service levels.

3.3 Data

One can only develop, implement and evaluate effective policies when basic data are available and known. To implement effective water demand policies, for instance by reducing groundwater abstraction by setting abstraction limits or introducing economic instruments, can only be done when one knows where the abstraction points are, what abstraction capacities/yields they have and what the actual status of the particular aquifer is. Estimates are that 75% of Lebanon's wells are not licensed despite legal requirements.

Various reports have been published on the status of the Lebanese Water and Wastewater Sectors in the last few years. It is interesting to note that these documents usually quote data from the NWSS (and Strategy document for Wastewater Sector) to describe the current infrastructure and service levels. In other words, no data are available on new achievements in commissioned infrastructure and service levels or, even more dramatic, such achievements are not considered significant enough to specify them as relevant new data. It seems time to come to annual progress reports on the developments in the water and wastewater sectors. Such annual reports could also include annual benchmark data on plans, targets and achievements of all actors in the two sectors.

The geological characteristics of Lebanon consisting mainly of karst formations with an abundance of fissures and cavities complicate adequate water management. Nationwide ground and surface water modelling as well as a GIS based information system on water flows, levels and abstractions will be a prerequisite for sustainable water resources management in the near future.

MoEW is planning to develop a Water Data Management Centre and it has a specific plan to produce a Water Atlas for all water resources and its use, using GIS and Remote sensing techniques. It submitted a proposal for discussion to the mission anticipating that the mission would be able to incorporate (parts of) it in projects that it might formulate (see Annex F). UNDP has sponsored a nationwide inventory of groundwater wells.

The development of a Water Atlas and the inventory of ground water wells are important steps, but much remains to be done to come to a situation wherein the Lebanese authorities have enough data available to effectively develop, implement and monitor water (scarcity) policies.

For the development of effective water scarcity policies one needs to have basic data to be able to regulate. It is recommended to make a start with annual or bi-annual reports on trends in water resources, service delivery and progress in the implementation of strategies and investment plans. The planned Water Data Management Centre could play a structural role in this reporting.

3.4 Solid waste management

Recent reports describe the dramatic impact of haphazard solid waste handling on water courses and water quality. Increasing awareness of the impact of poor waste management practices, coupled with investments in both institutions and equipment, is essential.

3.5 Storage capacity

If one assumes the renewable water resources remaining in Lebanon to be 2,7 billion m³/average year as per the NWSS, and the 2012 population to be 4,8 million, including Palestinian refugees, then per capita would be 562 m³/annum. If one adds 1,8 million Syrian refugees, then per capita would drop to approx. 407 m³/annum. These figures are all well below the generally accepted 1000 m³/year water scarcity threshold.

Increasing storage capacity is an effective way to increase availability and to enlarge water security. It is worth noting that most of Lebanon's precipitation is during the winter months – when demand is less, and that Lebanon's rivers are short – water quickly reaches the sea. About 20% of the renewable water resources replenish groundwater resources, the remaining 80% the surface water systems

The NWSS contains a large programme for artificial groundwater recharge and dams for surface water storage. Although IFIs just have approved the large Bisri dam project to improve water supply for the Beirut area, general progress in implementation of larger dam schemes is limited.

It is not only finance that is hampering implementation of these plans. The applicability of dams and reservoirs as a safe and environmentally sound solution for increasing overall water resources storage capacities is controversial in places.

Less controversial is the programme to develop hill lakes – smaller lakes that communities themselves can construct. Sand dams, check dams and other small scale interventions could probably contribute to increasing storage capacity, including groundwater recharge, as suggested a few times during discussions.

The exploitation of marine springs is also seen as a possibility. Technically it is feasible to catch fresh water near the shore line, but further studies on consistency of volumes will be needed. The economic feasibility is not clear yet. The largest volumes seem to come up at some distance from the shoreline at considerable depth.

Increasing water storage capacity is a very practical way to increase water security. A revised priority setting including further evaluation of risks and financing, might expedite

the implementation of the storage dams programme. It is recommended to further explore smaller scale interventions that will increase storage for less costs and which might be easier to implement.

3.6 Agriculture

Local agricultural markets are unstable and have an adverse effect on farmers' income due to the weakness and lack of transparency of marketing operations. This is also due to the marketing policies of operators in the agribusiness which are not usually in the farmer's interest. Therefore, structures for three types of markets should be established:

- the local market for fresh produce,
- a market for products intended for processing,
- a market for fresh agricultural produce and processed products intended for export.

Agricultural and rural cooperative movement is characterized by a lack of transparency and a disparate application of laws, and is thus far from the desired goals of collaborative work.

Drought periods such as 2014 with reduced precipitation necessitate the use of additional water from the country's water reserves. Additional groundwater in times of droughts can only be available sustainably if these reserves are replenished during periods of excessive precipitation and if on average recharge and discharge of aquifers are in equilibrium.

Since groundwater is over-exploited at present and the demand for municipal and industrial water is increasing, also due to the influx of Syrian displaced persons, agriculture should reduce its water demand and revert to alternative water resources such as treated wastewater.

The introduction of modern irrigation in the rural areas is quite successful on the modern farms (35% of the farmers) and should be facilitated and encouraged further. Modern irrigation systems without the knowledge when to irrigate and how much to irrigate does not increase the water efficiency. Due attention is to be paid to effective extension services.

3.7 Awareness

It seems that both authorities and the population do not feel the urgency to take measures to stop the further deterioration of Lebanon's water resources, be it water shortage or water pollution. Considering the already significant effects of the current dry year it is high time to start a nationwide campaign to change the basic assumptions and attitudes regarding rights and responsibilities on collective use of a jointly owned rapidly deteriorating resource.

For example, the extremely high number of illegal wells not subjected to water billing is a major constraint for adequate financial management in water services delivery. Illegal wells make use of Lebanon's public water resources which in the end is a precious public good.

Increasing awareness and changing the attitude towards water as a precious public good is a prerequisite for effective policies.

3.8 Pollution

Levels of pollution in coastal waters and river basins, in particular the Litani river basin, have reportedly increased dramatically. They will increase even more when the natural replenishment of water systems will fall short due to climate change effects.

Several initiatives are underway to strengthen the effectiveness of the industrial pollution management policies including a reinforcement of the compliance and enforcement system. Initiatives include awareness raising specifically targeting private sector industries through their associations and financing mechanisms to facilitate investments in pollution abatement technologies by the private sector. This includes the recently approved WB loan for the Lebanon Environmental Pollution Abatement Project.

A mix of command-and-control and incentives to enable industries to comply with requirements over time is required to address the situation affectively. Most elements appear to be in place and it is reportedly the strategy that has been adopted.

4 POTENTIAL ADDED VALUE DUTCH EXPERTISE

The Dutch water sector is a strong one. It is leading in many technologies and in the way water governance is organised. One of the objectives of the mission was to identify areas where the Dutch water sector could be of particular value to the Lebanese water sector, whilst acknowledging the generally high level of expertise available within the Lebanese water sector.

The Netherlands government has created a number of economic instruments for the facilitation of both aid and trade in the water sector in a restricted number of countries. Lebanon, however, is not amongst the countries where these instruments can be applied. Lebanon's relatively high income will have played a role in not being included in these country lists.

From the mission's perspective, the impact of water scarcity coupled with the impact of the Syrian crisis could be a ground for reconsideration thereby facilitating the use of Dutch water sector expertise.

The Netherlands is providing humanitarian assistance through UN and multilateral channels, including direct contributions to the Lebanon Syria Crisis Trust Fund (LSCTF). This may offer opportunities to engage Dutch expertise for addressing some of the immediate projects on the LSCTF projects list.

4.1 Co-operation with Water Establishments

The Netherlands could bring substantial value to the further development of WEs, especially providing assistance in capacity building and institutional strengthening by bringing in the expertise of Dutch water supply companies as well as Dutch water boards. Considerable expertise is available in providing such assistance.

The Dutch water supply companies are characterized as "Private Business with Public Owners", i.e. they operate as private sector entities but shares remains in the hands of public authorities.

In their international operations they have opted for co-operation models distinctly different from traditional PPP modalities. One of the modalities is the Water Operating Partnership (WOP), which can best be compared to a service contract but with higher levels of mutual commitments on performance output. This approach fits often better the receiving environments as it not only strengthens local capacities but also preserves the feeling of ownership with local entities by aligning interests. Co-operation between a WE and an operator can go wrong easily as illustrated by the sensitivities and controversies surrounding the 2003-2007 ONDEO management contract for Tripoli. Scheduled output under the contract included realization of metered house connections and full-time pressurized water supply ("24/7"). The assessment in hindsight by various stakeholders ranges from full satisfaction on the contractual output to considerable dissatisfaction and reservation on ONDEO's performance and output.

Dutch Water Boards look after water resources, flood risk management and wastewater treatment. They are full government entities and as such more restricted than water supply companies. However, they do engage in twinning-like arrangements under the right conditions. Internationally they present themselves as Dutch Water Authorities.

4.2 Equipment and Technologies

Dutch equipment and technologies that are of particular relevance for the Lebanese water market include:

- Remotely controlled water meters for house connections and well heads, and especially water meter calibration and testing equipment with related training.
- Package (emergency) treatment plants for water supply from surface water sources based on reverse osmosis preceded by appropriate pre-treatment.
- Package/Mobile wastewater treatment plants for small communities, focusing at settlements and municipalities that face temporary overloading of their wastewater collection and treatment systems due to the influx of Syrian refugees. Similar temporary solutions may be applied for small communities and municipalities with a backlog in wastewater treatment infrastructure development.
- Technology and equipment for sludge processing, treatment and disposal. The Ministry of Environment reported that relevant knowledge, skills and infrastructure are not yet in place. This creates in principle serious environmental hazards as sludge from wastewater treatment plants and septic tanks may be dumped in nature and cause severe pollution. Dutch private businesses have ample knowledge and experience in this field.
- Technology on good housekeeping regarding industrial water use. Pollution abatement starts with good housekeeping aiming at reuse and recycling of waste flows within the premises of an industry reducing the volume of process water transferred into wastewater.
- Technology and equipment for industrial wastewater treatment plants. Industries will have to start preparations for compliance in line with the strengthening of the monitoring and enforcement policies without further delay. Depending on size and location industries will have to go for individual solutions or collective solutions by means of centralized industrial effluents treatment plants for grouped industries. Dutch consultant and Engineering Contractors could offer services as well as hardware and software to come to timely solutions.
- Technology and equipment for solid waste management covering amongst others: hazardous waste handling (a.o. hospital/medical waste) and fully developed sanitary landfills complete with leachate collection and treatment as well as gas collection and exploitation.
- Dutch soil sensor technology companies and satellite observation of crop water use can provide the needed knowledge.

4.3 Water Storage and Artificial Recharge

In the Netherlands ample experience exists with artificial recharge. A good illustration is the city of The Hague that uses dune aquifers as its main source for drinking water. Aquifers that are recharged by surface water transported from the river Rhine.

Dutch companies and knowledge institutes have also gained wide experience in developing and implementing techniques in dry zone areas to increase water storage in aquifers. The IGRAC secretariat is housed with Unesco-IHE in Delft. Aquifer recharge is also used as a tool against salt intrusion which is also an increasing problem in Lebanon.

4.4 Agriculture

LARI, is working on irrigation advice to farmers through SMS. Modern irrigation technology without the knowledge when to irrigate does not reduce the tendency to over-irrigate. LARI has contacts with DACOM (Dutch soil sensor technology provider).

In addition to advisory systems for irrigation and disease control, modern farmers in Lebanon could also benefit from Dutch technology to increase the return on water. This includes greenhouse technology, double use of water by combining functions, but also agro-logistics and the reuse of treated wastewater.

The Ministry of Environment is working on reforestation of mountainous areas. For these projects there is a real interest for the Dutch developed Groasis Waterboxx (<http://www.groasis.com/en>).

Wageningen University is a leading institute in water and agriculture. Institutions as LARI have worked in the past with Wageningen, especially in EU funded research projects that are open to third countries. Further collaboration opportunities are now being investigated.

4.5 Data management

The Netherlands has well-developed water management information systems as the National Water Monitoring Network (Landelijk Meetnet Water) which derives measurement data about water quantity from the water system data about water quality as measured by measuring stations and laboratories. All measurement data ends up at the Water Management Centre, where data are interpreted and enhanced with weather forecasts from the meteorological institute and Deltares. Groundwater quality is monitored through the National Groundwater Quality Monitoring Network

The Netherlands can provide technologies, equipment and advanced knowledge in how to design water resources management information systems. This can include the design and installation of a GIS based information system that integrates on regional and national levels all relevant information in real-time data of meteorological conditions and in particular rainfall, flows, levels, abstractions and diversions in surface and groundwater systems as well as in large and small reservoirs, in order to optimize water resources management, conservation of water resources and sustainable exploitation. These services can be provided by suppliers, knowledge institutes and consultants.

4.6 Syrian refugees crisis

Support to hosting communities is an important element in Lebanon and the international community's response to the Syrian Refugee crisis. Significant amounts of money have been made available. One of the instruments that has been created is the Multi-Donor Trust Fund 'The Lebanon Syrian Crisis Trust Fund', administered by the World Bank. This Trust Fund finances new and ongoing activities, as identified under the Roadmap of Priority Interventions for Stabilization from the Syrian Conflict. The Netherlands is contributing 2.5 M€ to this Fund.

For the water and waste water sector for over 100 MUSD worth of projects have been submitted varying for drilling and equipping new wells to rehabilitating and upgrading

WWTPs and extending wastewater networks. Many of these projects are located in the Bekaa. An overview of the projects (mainly works and good) for the drinking water supply and waste water treatment projects is included in Annex H.

Dutch water sector technologies and goods could be of use as sketched above (water meters, package treatment plants).

Since 2011, the Netherlands has made 83.5 million EUR (106 Million USD) available for humanitarian assistance for Syrian refugees. Almost a third of this amount goes to relief in Lebanon.

ANNEX A – DRR-TEAM

Dutch Risk Reduction Team: reducing the risk of water related disasters

Many countries around the world face severe water threats. Often, these countries are in urgent need of expert advice on how to prevent a disaster or how to recover from a calamity. For instance, when a country has been struck by severe floodings and the first emergency relief workers have gone, the need for advice on how to build a sustainable and safer water future arises. To meet these needs with a swift response, the Dutch government has initiated the Dutch Risk Reduction Team (DRR Team). This team of experts advises governments on how to resolve urgent water issues related to flood risks, water pollution and water supply, to prevent disasters or to rebuild after water related disasters. With climate change and a fast growing world population, water issues are becoming more urgent. As a country renowned for its' expertise on water and delta management, the Netherlands feels a responsibility to share its' knowledge worldwide. That is just what the DRR team does; sharing expertise with governments to come up with the best possible approach/solutions for tackling urgent water issues. Because of the unique cooperation between government and sector, the best experts can be fielded quickly. The Dutch government offers a specific number of advisory missions each year.

Advice for all water issues

The Netherlands has brought its best water experts together in the Dutch Risk Reduction Team. It consists of high level advisors supported by a broad base of technical experts who can provide top quality and tailor made expertise to governments that are confronted with severe and urgent water challenges. The Dutch are experts in adapting to water in a changing world; from delta management to water technology, from urban planning to governance, public private partnerships and financial engineering.

How does the DRR team work?

Governments that have to deal with an urgent water issue are encouraged to contact the Dutch embassy in their region. The embassy will liaise quickly with the Dutch government. Interventions will only take place after a request from a central government has been received by the Dutch government, and after a recent calamity or to prevent a threatening disaster. The DRR team does not focus on emergency relief, but on sustainable solutions. If the decision to respond to the request is made, relevant Dutch experts will be rapidly fielded to the area that is under pressure. Together with the government and local experts, the situation will be assessed and analysed after which the team will come up with a set of recommendations. For example advice on technical interventions including immediate measures and long term sustainable solutions, advice on governance and advice on financing options. The DRR team enables a foreign government to take action on the basis of sound advice and expertise.

ANNEX B – TERMS OF REFERENCE

Project code: DRR14LB03

Context

Due to low precipitation and the influx of refugees from conflict areas in the Middle East, Lebanon is facing a potentially disastrous water scarcity problem. The Lebanese Ministry of Energy and Water has requested Dutch Risk Reduction Team (DRR-Team) to assess the current situation and provide expertise on water scarcity and management issues. For further background information, see the Preamble and Annex A.

Mission Specification

An official request for support from the DRR-Team on water management and water scarcity issues was sent to the Dutch Government on the 6th of June 2014 from the National Government of Lebanon. They have specifically indicated the implementation of water management guidelines and efficiency gains in water usage within the agricultural sector as major challenges. As a centre of agriculture and refugee activity, the Beqaa valley will be a focus of the mission. This Terms of Reference (ToR) concerns an assignment to send a scoping mission to Lebanon to explore these subjects.

Scope

DRR-Team is requested to:

- Advise and cooperate with the Lebanese government on water management and water scarcity issues
- Advise specifically on the efficiency of water usage in the agricultural sector in the Beqaa Valley and the implementation of water management guidelines
- Scope business opportunities for the Dutch water sector

Objectives

The scoping mission is to advise the Lebanese government and to determine where the Dutch water sector is able to assist the Lebanese government with regards to water management and water scarcity issues. The mission is furthermore to determine where opportunities for the Dutch water sector are in Lebanon (specifically Beqaa Valley) in the area of water management as a whole and in relation to the problems for adjacent sectors or niche markets, such as agriculture, urban development, tourism, water and energy, water quality (drinking water and wastewater treatment), environmental etc.

The objectives of the scoping mission are:

- Advise on implementing measures that could be taken on the short, medium and long term regarding improvement of the water management in Lebanon, especially in the areas of the implementation of water management guidelines and efficiency gains in water usage within the agricultural sector in the Beqaa Valley, taking into account where possible the already existing (strategy) papers and documents that have been accomplished by the government, World Bank, UN and other organisations on water related topics in Lebanon.
- Explore the political situation in Lebanon to find which relevant government authorities/ stakeholders should be involved to be able to actually improve water management in Lebanon.
- Explore possible solutions to mitigate the impact of the water issues on refugees, especially those living in informal camps

- Have a close look at the water situation in the Beqaa valley, including the way irrigation is used, and explore opportunities for Dutch cooperation with enterprises in the valley.
- Scoping the opportunities for the Dutch water sector in Lebanon (specifically in Beirut and the Beqaa Valley) including the political situation and entrepreneurial environment.

Approach

The scoping mission will visit the federal government in Lebanon. The mission should preferably fly to Beirut with a field visit to the Beqaa Valley. Lebanese investors/ companies, Dutch (water) companies/organizations and international financial institutions (IFI's) in Lebanon may be contacted to get a good scope on possibilities to execute projects within the integrated water management vision. The embassy will assist in planning the agenda for the mission. Due consideration to the security issues in Lebanon must be given by the embassy, DRR-Team and the mission members both before and during the mission.

Timing

The scoping mission should be realized in September 2014 in cooperation with the Dutch Embassy in Lebanon. The mission will take place from 22 September to 27 September.

Expected Results

Outputs

As a joint effort of the team of experts the mission has to result in the provision of the following reports:

- A mission report, with a description of conducted activities, including well defined sustainable measures, findings and recommendations for follow-up activities and possible business opportunities for the Dutch water sector in Lebanon.
- A report with recommendations for the Lebanese authorities regarding the improvement of water management in Lebanon including the specific issues described above.
- Preparation for possible presentation in Lebanon to present concrete results to relevant ministers

All reports and communication will be in the English language, including a management summary. Standards for the reports are provided in the Preamble.

Outcomes

- Visits to various stakeholders such as the federal Government, the Lebanese Water Scarcity Task Force, Civic Influence Hub, the local government of the Beqaa Valley, IFI's and Dutch water companies/NGO's already working in Lebanon.
 - Knowledge of issues that need urgent actions, working toward a sustainable approach in the long term, with a focus on areas the Netherlands will be able to assist in according to their added value.
 - Presentation by the mission of their opinion on whether a follow-up mission should take place and, if positive, what the follow-up activities should include and how these activities will be financed.
-
- Knowledge of the willingness of Lebanese parties to work with Dutch companies.

Background

For the past 10 years, the natural water resources in Lebanon have been decreasing. This is especially due to lower snowfall in the mountains. This year has been a turning point for Lebanon because of the extremely low precipitation: less than 50% of the amount of last years rainfall is expected this year. Furthermore, meteorologists expect a negative trend in rainfall to develop in the coming years.

Due to current water management practices, Lebanon faces water issues with regards to both the quality and the quantity of water. The quality of the water is endangered due to pollution and overexploitation. In terms of the quantity of water, a shortage of hundreds of MCM (million cubic millimetre) of water is expected this year. Only 17% of the total available supply of water, approximately 1400 MCM, is actually used. With the current state of water management, Lebanon would not be able to meet the demand for water even in periods with normal amounts of rainfall. At the moment South Lebanon is the only Lebanese region that can keep up with the demand for water. Moreover, the water scarcity is already having detrimental effects on the local flora and fauna. If this scarcity persists for the coming years, the biodiversity in Lebanon will be endangered.

The scarcity is exacerbated by the influx of refugees in Lebanon. The conflicts in Syria and the Palestinian Territories resulted in millions of refugees throughout the Middle East. Approximately 1.2 million Syrian refugees have fled to Lebanon since the start of the conflict. The influx of refugees has put significant pressure on national water and wastewater facilities, resulting in a deterioration of services for local communities. Many refugees also stay in informal camps with poor or no access to WASH facilities. Combined with the issues described above, the water scarcity could have disastrous effects.

International context

The water shortage will have detrimental effects on the large number of refugees who mostly originate from Syria and the Palestinian Territories. The Syria Regional Response Plan 5 was an inter-agency regional response to the influx of refugees in various countries which included measures in the area of WASH. It aimed to improve access to water, latrines and water facilities. Besides Lebanon, Iraq and Jordan also experience problems with water management due to the influx of refugees, albeit on a smaller scale. Water scarcity will be a problem in the long term. In the coming decades, water availability per capita in the Arab region is projected to drop by 50%.

National context

Due to a number of interconnected factors, such as climate change, bad water management, the failure to preserve natural resources, pollution and urban sprawling, Lebanon is facing various water and environmental issues. A Water Scarcity Task Force was set up by the Lebanese government in cooperation with UNICEF, UNHCR and a wide number of sanitation and humanitarian partners in the country to improve resource monitoring, demand measurement and loss minimization. To further help rein in the country's wasteful water industry, the Lebanese government has developed water management guidelines for each administration. As mentioned, the implementation of these guidelines will prove to be challenging.

Different institutions already have researched the water issues in Lebanon. The World Bank Country Assistance Strategy broadly analyses the water situation and the World Bank Country Water Sector Strategy 2012-2016 goes into more detail. The Groundwater Assessment and Database project, an initiative by UNDP, is planned to be finished this

June which establishes a national groundwater database at the Ministry of Energy and Water (MoEW).

The Civic Influence Hub (CIH) is a consortium of Lebanese business people which aims to tackle national socio-economic problems within Lebanon. Areas CIH is active in are water, energy, environment, urban planning etc. To meet its goals, CIH pursues public private partnerships. As a response to the water problems in Lebanon CIH started a 5-year project (2015-2020) called the Blue Gold Initiative. The project aims to optimize and reform the Lebanese national water strategy and will have a budget of US \$5 billion, financed through private means, PPP's and consumer contributions.

Beqaa valley context

The Beqaa valley is approximately 120km in length and 16km wide. It is the centre of agricultural activity in Lebanon, which contains 40% of the country's arable land. This makes the Beqaa valley the "bread basket" of Lebanon. Many refugees are staying in the valley: the UNHCR reports over 400.000 registered Syrian refugees in their settlements. The actual number of refugees in the Beqaa valley likely is much higher as the UNHCR number only includes registered refugees which may not include all those refugees living in informal settlements, which is believed to be the setting that most of the refugees in Lebanon live in.

ANNEX C – MISSION PROGRAMME

Tuesday 23 September 2014

Ministry of Energy & Water	Dr. Fadi Comair Mona Fakih G. Beiodun
Beirut & Mount Lebanon Water Establishment The Green Plan Creen	Joseph Nseir Mohamad Chamas Prof. Wajdi Najem
Civic Influence Hub	Ziad El Sayegh Nizal Al Awar
American University Beirut North Water Establishment South Water Establishment	Prof Musah Nima Jamal Krayem Ahmed Nizam

Wednesday 24 September 2014

FAO	Dr. Maurice Saade Elie Chouerie
USAID	Rami Wehbeh Rick Albani Charbel Hanna
SDC AFD Consultant	Heba Hage Felder Dalia Lakiss Samuel Lefevre Abdo Tayyar
UNDP	Jehan Seoud
EU Delegation	Alexis Loeber Cyril Dewaleyne

Thursday 25 September 2014

Bekaa Water Establishment	Maroun Mousallem
Lebanese Agricultural Research Institute	Michel Antoine Afram
Agric. Cooper. Ass. Ministry of Agriculture Bekaa	Ibrahim Tarshishi AKL Khalil
Central Bekaa Union of Municipalities	Dr Darhgam Touma Maher Baker
UNHCR	Peter Okullo

Friday 26 September 2014

Ministry of Environment	Dr. Manal Moussalam Mr. Nadim Mroué
Ministry of Agriculture	Chadi Mhanna Maya Mhanna
Prime Minister's office	Zeina Majdalani
Council for Development & Reconstruction	Youssef Karam Wafaa Sharafeddine
World Bank	Houssam Beides Mouna Couzi

ANNEX D– KEY DATA OM WE'S

	WE Beirut&ML	WE North Lebanon	WE South Lebanon	WE Bekaa Valley
Estimated population in service area WE (Nos.)	2,500,000	920,000	775,898	525,086
Registered number of household connections (Nos.)	250,000	115,321	141,973	67,383
Estimated total population served (Nos.)	2,000,000	530,000	667,272	309,962
Water Supply Service Coverage (%)	100% (by rationing)	57,6	86	68,5
Estimated average daily water production (m3/day)	350,000- 550,000	198,000	306,761	183,562
Total average Water Sales as billed (m3/day)	520,000	121,175	160,129	85,301
Non-Revenue Water (%)	6%	47,6	47.8	53,5
Bill collection efficiency (%)	78%	65	55.3	32
Nos. of staff (total fte) per 1000 connections	4,8	4,6	3.57	
Average monthly water bill per connection (LBP, flat rate)	1632	20,000	16,666	
Estimated average sales price of water (LBP/m3 water)	630	657		

ANNEX E – LITERATURE

Ministries Lebanon

- National Water Sector Strategy, Ministry of Energy and Water, 2010
- Strategy for Wastewater Sector, Ministry of Energy and Water, December 2010
- National Report to the United Nations Conference on Sustainable Development (Rio+20), Government of Lebanon, June 2012
- Policy Paper & Action Plan for Industrial Wastewater Management in Lebanon, Ministry of Environment, November 2013
- Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions, Ministry of Environment, September 2014

IFIs and donors

- Lebanon - Country water sector assistance strategy (2012-2016). Washington, DC: World Bank 2012.
- Lebanon - Economic and social impact assessment of the Syrian conflict. Washington DC ; World Bank 2013.
- Lebanese - Water Supply Augmentation Project. Washington, DC : World Bank Group. 2014
- Lebanon - Environmental Pollution Abatement Project. Washington, DC : World Bank Group 2014
- Etude de capitalisation sur le secteur de l'assainissement au Liban, ADF, May 2014
- Cost assessment of water resources degradation of the Litani basin", EU, SWIM project, 2013

Other

- Civic Influence Hub, Blue Gold of Lebanon, 2013
- Business Plan 2013-2017, Bekaa Water Establishment, November 2013

Links

Ministry of Energy and Water: <http://www.energyandwater.gov.lb/>

Ministry of Environment: <http://www.moe.gov.lb/>

CDR/ Water projects: http://www.cdr.gov.lb/eng/select_projects_sector_D_action.asp

WB/ Lebanon: <http://www.worldbank.org/en/country/lebanon>

AFD/Lebanon: <http://liban.afd.fr>

UNDP/Lebanon: <http://www.lb.undp.org/lebanon/en/home.html>

EU SWIM/Litani: www.swim-sm.eu/files/Assessment_Litani_EN.pdf

Civic Influence Hub/ Blue Gold: <http://bluegoldlebanon.com/en/>

SEPARATE ANNEXES

ANNEX F – PROPOSAL FOR DISCUSSION SUBMITTED BY MOEW

ANNEX G – OVERVIEW OF POTENTIAL CO-OPERATION AREA AND FIRMS

ANNEX H – WATER SECTOR PROJECTS SUBMITTED TO TRUST FUND

ANNEX I – PRESS CLIPPINGS

ANNEX J – PRESENTATION PRELIMINARY CONCLUSIONS