Mediterranean Regional Technical Meeting

Dealing with water scarcity through desalination, non-revenue water reduction and PPPs

Summary Report

Center for Mediterranean Integration, Villa Valmer, Marseille, December 12-14 2016
# Agenda at a glance

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## Download presentations

You can download all presentations from the workshop here:  
Opening session: Setting the stage – dealing with water scarcity in the Mediterranean
Day 1: Monday, December 12 2016
11:00-12:00

Steven Schonberger from the World Bank kicked off the workshop by asking why the Mediterranean - given its long experience in managing water scarcity - is not currently the global leader in water security, even though half of the world's desalination is taking place in the Middle East and North Africa. For this to happen, there must be a combination of policy, technology and management systems, and most importantly the development of a "made in the Mediterranean" expertise.

Bill Kingdom from the World Bank brought some insights from a 2006 report, which defined the main characteristics of a well-performing WSS service provider, and asked whether we could start seeing a shift towards this in the Mediterranean. This included:

- Good governance and improved accountability to customers
- Autonomy to make decisions and not be influenced by politics
- Incentives to deliver good and efficient services
- Customer-oriented
- Finance - through improved efficiency and predictable transfers from government
- Mobilizing finance
- A sound policy environment to make all of the above work.

Emilio Gabrielli from the International Desalination and Reuse Association (IDA) highlighted the value of this workshop in bringing desalination, reuse and NRW - topics that are often addressed separately - together. In a few decades, the cost of desalinated water had decreased more than tenfold, making it now a more affordable option at times than treating or pumping water from afar for some cities.

Stephane Dahan from the World Bank showed that most of the Mediterranean population (60%) lives in areas of high or very high water stress, and argued that managers need to look at the entire urban water cycle by developing and diversifying conventional and non-conventional resources, as well as on the demand-side by reducing urban water needs, and look at potential trade-offs by cooperating with other users in or beyond the basin. The World Bank's Water Scarce Cities initiative (which is being launched at this workshop) aims to contribute to this paradigm shift by providing technical support and facilitate peer-to-peer exchanges between interested cities.

During the Q&A participants pointed out the need to be inclusive of other sectors in efforts to integrate urban water management, in particular the energy sector; and on the huge improvements needed in terms of efficiency for regional services providers.
Thematic presentations: Dealing with water scarcity through PPPs for desalination and non-revenue water reduction

Day 1: Monday, December 12 2016
14:00-18:00

Thierry Davy from the World Bank and Marta Moren-Abat from the Environment Directorate General of the European Commission (EC) presented the EC’s mandate on water, which focuses on water quality but not water quantity (which is the purview of member states). 100 million people in the EU suffered from the 2003 drought, with a total cost of 8.7 billion euro. To address this, the EC started by looking for a definition of drought and water scarcity which could be applied from Finland to Spain. This led to 2 concrete outputs: the 2007 EU communication and the 2012 Blueprint to safeguard Europe’s water resources. A proposal for EC legislation of water reuse standards is expected by mid-2017. This approach was highlighted by two case studies: Spain, in which drought management plans are embedded in river basin management plans, and include emergency plans for urban areas; and France, in which drought management is the purview of the river basin agencies, and which has pioneered an inter-sectoral trading mechanism in which the state compensates hydroelectricity producers when more water is needed in times of drought for water and agricultural users. The following discussion highlighted the need to think more of an insurance scheme for this type of scenario, which is very costly for the state. The management of aquifers is seen as insurance for farmers. The pricing of water for farmers in the EU is complex: there are a number of countries where they do not pay for water, but this is the mandate of member countries: EC directives only ask for transparency on water pricing, and to account for environmental and resource costs.

Bill Kingdom from the World Bank highlighted that one of the most efficient ways to improve the financial sustainability of a WS service provider was to fix NRW. However, staff capacity and incentives in public service provision are often not aligned with this objective. How can public WS providers fix high commercial and/or physical losses? One option is to use Performance-Based Contracts, which can help utilities address (i) a backlog of fixing leaks, which has translated into high leakage or (ii) routine maintenance to ensure leakage remains low. Contracting can be bundled or done with various degrees of unbundling and is usually for 4-5 years minimum, keeping in mind that risks and responsibilities need to be shared appropriately to avoid inter-party disputes or high prices; keeping in mind that the speed of implementation, not just the price, should guide the decision to work with the private sector. This has been done, for instance, in Ho Chi Minh City for physical losses (see Box 1 below) and in the Bahamas both for physical and commercial losses. One issue that often comes up is the lack of a reliable baseline at the start of the contract, which can be a risk for the private sector - in which case, it is recommended not to have a rigid baseline set in the contract but to establish the baseline and endline once DMAs have been set up.
For more information and resources on Performance-Based Contracts for NRW reduction, please see here.

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<th>Box 1: the Ho Chi Mink city experience: reducing NRW with a performance-based contract</th>
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| As part of the World Bank's Vietnam Water Supply Development Project and with the support of PPIAF, the Saigon Water Corporation launched a competitive tender for a performance-based contract for NRW reduction for one of its zones. The overall project design was to contract out all NRW reduction works (as performance-based contracts) for one of SAWACO's service areas (Zone 1) to the private sector while undertaking a traditional contracting for another area (Zone 2). As a result of the activity, a five-year performance-based NRW contract (4 years for leakage reduction and 1 year for maintenance) was awarded in July 2008 to Philippine-based Manila Water Company, Inc. (MWCI), which teamed up with Vietnam-based Construction Technology Development JS Co to win the contract to increase the efficiency of the water system and establish around 100 district monitoring areas (DMAs) to manage leakage and system expansion works in Ho Chi Minh City. Establishing the DMAs took time due to transport congestion in Ho Chi Minh City, but the results were impressive: the volume of leakage was halved in Zone 1 – equivalent to 100,000m3/day (enough water to serve 500,000 people) with less than 1% of the distribution system replaced.  
Source: B. Kingdom (blog); PPIAF (2012) |

Emilio Gabrieleli from IDA gave a historical overview of the development of desalination, of which records exist since Roman times but which took off as an industry in the second half of the 20th century. Developments in energy recovery mechanisms led to a decrease in price and a boom of desalination since the start of the 21st century: currently 300 million people worldwide rely on desalinated water. Even London relies for 25% of its fresh water supplies on desalinated water. Looking to the future, Emilio expects development of desalination capacity to increase at twice the speed particularly in China, India and Brazil, where the next World Desalination Congress will take place. In terms of technology, he expects that Reverse Osmosis will continue to dominate the market, and that the use of solar energy (through Concentrated Solar Power (CSP)) will become increasingly relevant particularly in the Mediterranean region.

Carlos Cosin (independent consultant) gave an overview of capital and operational costs for Reverse Osmosis (47% installed capacity in MENA) and thermal (53% installed capacity in MENA) desalination technologies. Around half of desalination projects worldwide are under a PPP arrangement; the main drivers of price for the private sector are (i) plant size and maturity; (ii) the region and area, in particular the regulatory environment (iii) the choice of technology (RO/thermal) and (iv) water quality (in particular Total Suspended Solids (TSS)) and temperature. Return rates for the private sector in the Mediterranean are generally better than other regions outside MENA due to maturity of market and regulations. Looking to the future, Carlos also expects more use of RO; efficiency
improvements; and energy savings; but the price of desalinated water will likely plateau around 0.3-0.5 USD/ m3. Innovations will likely come in the form of hybrid desalination plants (RO/ thermal) and the increased use of solar power, though it may be more appropriate inland than in coastal areas due to its large land footprint. The discussion highlighted that staff training for O&M of desalination plant was difficult due to the ever changing technology and yet crucial: for example, in Algeria: 22 plants of 1000 m3/d were supplied and one year later not one plant was in operation as staff had not been trained on how to maintain the membranes.

Zael Sanz and Philippe Marin from the World Bank highlighted the factors to take into account when choosing the right contractual arrangement for private sector involvement in desalination projects. How is desalination different from the usual risks that can affect large infrastructure projects? In desalination, it is often more advantageous to take advantage of the contractor's expertise for the operation and maintenance of the plant: under DBO contracts, a fixed O&M fee is most commonly used. Under a BOT approach, the utility enters into water purchase agreement with the contractor; design and financial risks are transferred to the contractor, but the utility needs to be flexible with the contractor who may have taken out loans in foreign currency and agree to share the currency risk by indexing the price of the WPA to the exchange rate of the currency in which the developer has taken out loans. Raw water quality and quantity is partially transferred to the developer: to get a lower price, the utility (or the contractor, depending on timing and contractual arrangements) may find advantageous to run pilots in the area in preparation of the tender. Engineering Procurement Construction arrangements may lead to costs overrun and construction delay risks.

Thematic presentations: Dealing with water scarcity in Mediterranean islands
Day 2: Tuesday, December 13 2016
08:30-10:30

Nicholas Petroulias from the Hellenic Water Association presented the situation of water services in Greece, where all service providers are publicly owned and managed, with the exception of two semi-public service providers in Athens and Thessaloniki. Greek water utilities are characterized by low efficiency (high physical and commercial losses with NRW averaging 50-60%) and low energy-efficiency, with energy accounting for over 50% of the costs of service provision on average. The regulatory framework for water abstraction was only recently modified to monitor groundwater abstraction, though enforcement and monitoring are still lagging behind. The Hellenic Water Association tries to overcome through the dissemination of EU and IWA best practice approaches. Water resources are characterized by overexploitation and saline intrusion. With regards to non-conventional resources, there are currently 157 desalination plants in Greece, which are used particularly
to meet increased demand in the summer in municipalities, as well as high demand for irrigation water particularly in the centre of the country.

Nikos Neocleous from the Water Development Department of the Ministry of Agriculture, Rural Development and Environment of Cyprus and Bambos Charalambous (independent consultant) gave an overview of water resources in Cyprus, where total water demand has been met by a combination of available conventional (water storage development) and non-conventional resources (desalination (33 Mm3/year) and reuse (8 Mm3/year)) in the past two decades. The efficiency of large water supply service providers is generally high (with rates of NRW close to 20%), but the rates of losses can double or triple in smaller villages. Cyprus has been hit by droughts in recent years; during the last drought (2005-08), the authorities tankered water from Greece for domestic water supply during 8 months. This measure was costly both in the short-term (with an average price of tankered water of 6.5 Euros/m3) as well as in the medium-term: piped water supply was provided intermittently during the drought, which resulted in higher water losses due to an increase of breaks in the mains. Similarly to Greece, groundwater has been historically over-abstracted and subject to saline intrusion, but abstraction and drilling is subject to licensing, which is well enforced. Existing unlicensed boreholes owners were given a 1-year amnesty to request a permit to abstract water - after which they could be taken to court and their boreholes closed. Desalination is an integral part of the water supply strategy, but its use is restricted to years with low rainfall as the cost of desalinated water is not entirely recovered through tariffs, particularly in years when the price of oil is high. Pricing of desalinated water purchase agreements includes a Standby Operation and Maintenance fee - so the water authorities compensate the desalination plan operator in years of good rainfall.

Konstantina Toli from GWP Med presented some of the activities of the award winning Non-Conventional Water Resources Programme in the Mediterranean, which aims at demonstrating small-scale solutions for the development of non-conventional water resources in Cyprus, Greece, Italy and Malta (between 2008-2018). The challenges there center around meeting seasonal water supply linked to tourism, as the population can increase up to 30 times during the summer. The project works both on the supply angle (domestic and institutional rainwater harvesting in Athens and Malta, stormwater harvesting in Syros islands in parks, greywater recycling at the domestic level) as well as demand (water saving kits for domestic water use). The project also installed small water desalination kiosks in remote areas in Greek islands, which are managed by local authorities. The project also includes training for engineers and architects by including non-conventional water resources development and management in education curriculae and sensitizing the general public through social media outreach.

**Thematic presentations: Case Studies: The Integrated Urban Water Management Approach**

**Day 2: Tuesday, December 13 2016**

**11:00-12:00**
Malika Belkouadssi from ONEE and Richard Abdulnour from the World Bank presented the history of water supply development and management in Marrakech, starting with the traditional Khetarrat, which used to bring water from the Atlas mountains to Marrakech. As the city grew in the 1960’s, this system was supplanted by boreholes in the 1950’s. In 1972, ONEE - the National Water and Electricity Office - was created and tasked with raw water resources development and management; water services distribution is the task of an autonomous public utility, RADEEMA, in Marrakech. As Marrakech continues to expand, it seeks water further and further: in the 1980’s groundwater resources no longer suffice, water is brought via the Canal Rocade from the Hassan 1 Dam, located 120 kms away from the city and shared with agricultural water users. In the 1990s and early 2000s, Marrakech experiences a rapid increase in water demand due to tourism, with close to 20 golf resorts being given permission to develop in the city - which gave ONEE serious concerns about not being able to meet these additional demands. At the time, RADEEMA also had high levels of NRW, even though the city was running out of water. A meeting presided by the prime minister gave ONEE reason and mandated RADEEMA to supply the golf developers with treated wastewater for irrigation, as well as decrease their rate of NRW. RADEEMA managed to decrease its NRW by 20 points in 10 years, and the treated wastewater scheme was completed for a smaller number of golf resorts in 2012. Marrakech has since had a couple of close calls with their water supply - most recently in 2012-13 when there was a drought which left only a few months’ worth of water supplies in the reservoirs. This is where the World Bank is bringing in technical assistance to help Marrakech diversity its water sources through improved groundwater management, reservoir management, and tertiary treatment and water reuse for irrigation. It is to be noted that in Morocco, tariffs are decided by an interministerial committee and rarely raised, which makes the development of costly non-conventional water resources difficult to recover for ONEE - especially since so far, the government has refused to subsidize them.

Bob Yamada from the San Diego County Water Authority presented the water supply strategy of the SDCWA, a wholesaler of water in South California. Currently, the SDCWA gets most of its water from the Colorado River, as well as from a transfer from North California. Most of its own supplies (which currently only represent 16% of its total water allocation) come from the development of non-conventional resources, in particular desalination; but agencies have also invested in water recycling and are moving toward potable water reuse. The Claude “Bud” Lewis Carlsbad desalination plant is the largest in North America on a BOT basis with a 30-year contract. The diversification of water supplies also includes water transfer agreements with farmers (paying farmers to supply additional water to SDCWA) as well as lining canals to provide additional supplies. The costs of desalinated water produced are estimated at USD 1.72/ m3. There is scope for managing demand as 65% of water use in San Diego County is for residential purposes - this amounts to 330L/capita/day, half of which is used for outdoor irrigation. The SDCWA engages with the public over drought conditions (whenindrought.org and water waste reporting app). During the most recent drought, the state imposed statewide mandatory restrictions, but recognizing the progress SDCWA has already made, has granted yearly self-certification based on stress test.
Fabien Mainguy from Suez presented the case of the Performance-Based Management contract in Jeddah, Saudi Arabia, where Suez provided assistance to the recently-created National Water Company. Almost all of the water supplied in Jeddah comes from desalination plants. The scope of the contract included management support and training as well as NRW reduction and improvement of continuity of water supply, Key features of this contract was the possibility of redoing the baseline for some of the KPIs after the start of the contract, in particular NRW reduction, but the limited transfer of responsibilities to the private operator was a major constraint for achieving tangible improvements. Only 20% of the population of Jeddah has continuous water supply; the frequency of water supply for the rest of the city increased from once every 23 days to once every 8 days.

Francois Lacour from Veolia presented the co-management Oman PAEW contract - which started in January 2011 for 5 years, with 10 key staff from Veolia directly embedded in the utility. The contract governance included an executive management committee with more weight given to PAEW as well as an independent auditor. This contract included a restructuring of the utility and setting-up of quality management systems, as well as the development of a water sector master plan and a business plan for the utility (which was approved by the ministry of Finance). Savings were made both on capital expenditure (through design and hydraulic modeling review) and operational expenditure (through re-working of contractors' scope).

Oman PAEW covers 47% of residents but its perimeter increased by 25% between 2011-2014, when it had to integrate 'private networks' which were usually in poorer condition than the utility network (the rest of the city is supplied by tankers). 80% of the water comes from desalination plants. Challenges included managing new connections and maintaining the continuity of water supply, as well as managing contractors in charge of DMA set-up. NRW reduction targeted in priority commercial losses through the inclusion of large consumers in the billing system, and focused only on the areas in which DMAs were set up - the main challenge was to integrate leaky private networks in the context of conflicting KPIs with changing perimeters.

SPAIN: Fermin Lopez Unzu presented the structure of Acuamed, a Spanish public agency tasked with implementing and operating 12 desalination plants and their distribution networks through a management agreement signed with the Ministry of Agriculture (as
well as water reuse and water transfers projects). This includes the largest desalination plant in Europe (Torrevieja). The plants run on average at 45% of capacity; 5 out of 12 plants are used for irrigation (for high-value crops), with tariffs averaging 0.4-0.55 Euros/m³. Energy for desalination plants is bought through the energy futures market; there is still some room to improve energy efficiency.

**ALGERIA:** Khaled Gasmi presented the role of the Algerian Energy Company (AEC) which co-develops desalination plants in Algeria along with foreign investors. There are currently 11 desalination plants in Algeria providing 1/5 of drinking water needs nationwide, through 25- or 30-year DBOO schemes and creation of Joint Ventures with at least 49% of the shares owned by the Algerian state. The Algerian Oil Company typically guaranteed a large portion of the commercial debt, allowing the private investors to access favorable rates. There is only one MSF plant (Kahrama), which was financed by AEC; the others are all RO plants and were financed either through local financing or by OPIC. Water is purchased on a 'Take or Pay' basis, with prices reviewed regularly to account for inflation. Conflicts of interest may arise between AEC and the foreign investor when they choose the constructor and operator of the plant.

**ISRAEL:** Ronen Wolfman from Hutchison water presented the largest desalination plant in the world - the Sorek desalination plant, a BOT project in Israel, which currently produces 150 Mm³ per year of desalinated water at the very competitive price of $0.53 per cubic meter. Operational use started in 2013 and the plant runs at 100% capacity. Water is sold through a take or pay scheme, with a fixed (indexed to currency basket and CPI - to cover capex, fixed energy and O&M costs) and a variable (covering incremental costs) tariff, which is linked to the mix of currencies in which the private sector operator took out the loans. Key to its success in keeping prices low is (i) the plant having its own power station, (ii) innovative engineering and membrane design to reduce the plant's land footprint (iii) proper risk allocation between the government and the private sector and (iv) flexible financing with the currency exchange risks being taken on by the government.

**AUSTRALIA:** Domingo Zarzo from Valoriza Agua and Miguel Angel Sanz from Suez presented some of the innovative Australian desalination plants their respective companies have been involved in. The particularity of Australian desalination plants is the innovative financing scheme: BOTs are structured under the so-called the Alliance concept (see Box 2). This ensures risks are kept shared equally between the private sector and the client and limited to the potential benefit of the private sector. Australia has innovated by building and operating some of the greenest desalination plants in the world: in Melbourne, where all of the energy comes from renewables; and in Perth, where the impact of backwash water discharge on the environment was monitored and found to support marine life.

**Box 2: the Alliance concept in Australia: an innovative form of PPP**

The Alliance is a PPP based on the sharing of risks and benefits between the operator and the client, which has been developed in Australia by the Federal government as an innovative way of partnering with the private sector. The partners must work together on a basis of trust, in a spirit of openness and ethics, and in a culture of performance and innovation thanks to a tailor-made joint leadership unit. The Alliance contract is managed through a governance structure called the "Alliance leadership team" and a management...
team. These two entities bring together representatives of each of the parties associated with the contract. In the case of the contract with the City of Adelaide, SUEZ ENVIRONNEMENT has a share in the partnership of 25%, with its subsidiary Degrémont having 25%, and Transfield (an Australian energy and transport services operator) 50%. Each of these companies is entitled to representation in the "Alliance leadership team", with two executives from SUEZ, two from Degrémont and three from Transfield. The State public water services company SA Water, has two representatives. In February 2012 the Alliance was signed, with greater involvement by SA Water in operations: asset management, new connections, SCADA (Supervisory Control and Data Acquisition) and the management of call centres. Another major advantage of the Alliance contract is the nature of the relationship with SA Water, namely complete collaboration between the two entities (operations, finance, etc.), which enables the public authority to take back the operation of the plants if it so wishes, but can rely on the technical expertise of a private sector operator.


Roundtable with government's delegations from Mediterranean and MENA
Day 3: Wednesday, December 14 2016
9:00-12:45

Miguel Garcia Herraiz, Deputy Secretary General of the Union for the Mediterranean (UfM) opened the day with a keynote speech, highlighting the role of UfM as a bridge between governments, the private sector and civil society in the Mediterranean. He announced that the UfM is currently working on a new ministerial declaration which will set a common agenda for water policy in the Mediterranean.

Selma Jariri from ONEE (Morocco) gave an overview of water management in the context of scarcity in Morocco. A national strategy for the development of non-conventional water resources was approved in 2009. Desalination is becoming increasingly relevant to water supply in Morocco, which is developing a dozen desalination plants of a cumulative capacity of 260 000 m3 per day, and envisages to continue developing desalination plants for a cumulative capacity of 400 million m3 per year by 2030. At the moment, all of the desalination plants in Morocco are based on RO technology and were developed based on EPC, aside from the flagship BOT project of Agadir (the largest in the country). A feasibility study is currently being undertaken to assess how to best associate renewable energy for desalination. ONEE is not the only developer of desalination plants - OCP and the Ministry of Agriculture are currently developing desalination plants for agricultural and industrial use respectively. ONEE is currently confronted with a financial sustainability issue - as it has been tasked with financing the development of non-conventional water resources such as desalination which the state has refused to subsidize in the past, even though it provides
funding for the development of conventional resources. Finally, ONEE called upon the private sector to provide more agile solutions to desalination - for instance through small mobile desalination plants (of an average capacity of 10,000 m³/day).

**Ben Aich Mondher from SONEDE** outlined some of the issues Tunisia faces in urban water supply, particularly NRW reduction. SONEDE provides continuous water supply to 90% of the population in Tunisia, and covers smaller and large towns and urban areas. Whereas the yield of urban water systems averaged 86% in 2000, it is now down to 76% due to (i) low tariffs, (ii) lack of precision of metering and water supply accounting and (iii) the state of disrepair of the distribution network. Tunisia has set itself an objective of improving water efficiency through (i) sensitization and (ii) training of external auditors (trained to carry out audits for large water consumers every 5 years). There are no current PPP projects for water supply in Tunisia ([there is a desalination project in development for industrial use](#)) but two regional 10-year O&M contracts are in preparation with national sewerage utility ONAS.

**Sadi Ali from the Palestinian Water Authority** outlined the situation in the West Bank, where desalination is the only option for water supply as the coastal aquifer is completely depleted. Currently, there are close to 400 service providers in the West Bank and Gaza; institutional reform is taking place to improve efficiency. NRW is currently estimated at 40% but there is no reliable data; there are plans to set up DMAs in some key areas to improve efficiency. It is difficult to attract the private sector in the West Bank and Gaza, even though there is a history of private sector participation (with World Bank support). IFC is currently involved in the solar power project with the private sector, and the World Bank is providing support to assess whether a Performance-Based Contract for NRW reduction would be feasible in Hebron.

**Hamze Tuerkman from the General Directorate of State Hydraulic Works (DSI) of Turkey** highlighted the relatively high level of NRW in Turkey due to commercial and physical losses. DSI is a financially autonomous entity with a similar role to that of ONEE in Morocco: it is a producer, transporter, and wholesale retailer of water and also provides services in small towns. Water supply coverage is close to 91% in Turkey, up from 75% in 2001. Turkey hasn’t needed to invest in non-conventional resources so far and DSI has limited experience in desalination; due to population growth and climate change, Istanbul is piloting a feasibility study for desalination and there are pilot projects for water reuse. **[Iler bank](#)** has traditionally provided financing for infrastructure but is facing creditworthiness issues which may lead to more plans for PSP.

**Jamal Krayem** (Director of the North Lebanon Water Establishment) and **Joseph Nseir** (Director General of Water Authority of Beirut and Mount Lebanon) from Lebanon gave an overview of the situation in North Lebanon and in Beirut respectively. The challenges are multiple: Lebanon has taken on the highest proportion of refugees in the region (25% increase in residents in the past two years) and is currently in the middle of a drought. Tripoli is the only city with 24/7 water supply in Lebanon; however, it has seen a huge increase in demand in the past few years due to the influx of refugees and has limited potential for further water resources development. NRW reduction and demand management are the only options today for the utility as groundwater resources are
depleted and in need to rehabilitation. In Beirut, a pilot scheme (see Box 3 below) successfully showcased that continuous water supply can be provided with the same amount of water with very little funding. This approach is being scaled up to other areas of the city.

**Box 3: The Beyrouth pilot scheme for NRW reduction**

The World Bank supported a twinning partnership between the Malta public water utility WSC and the Beirut Mount Lebanon Water Establishment (BMLWE), which aimed at re-establishing 24/7 water supply in a pilot area of downtown Beirut with about 5,000 residents. With the help of Maltese experts on the groumd, the following steps were taken: 1. Establishing the pilot zone and setting up a DMA 2. Carrying out leak detection by night and repairs 3. Repairing tanks in the building 4. Reducing the water pressure to 2 bars 5. Carrying out leak every 2 months. The network was then successfully fed with continuous water supply, with the same quantity of water as previously when water was only provided for 7 hours out of 48 hrs (5000 m3). This approach was then spread to 6 zones by BMLWE staff with very little funding, and the utility is now working with the World Bank to gradually scale up this approach to all metropolitan Beirut.

**Mohammed Ahmed and Deka Khaireh Allaleh from ONEAD (Djibouti)** outlined some of the challenges facing Djibouti-ville, one of the most water-scarce cities in the world. Traditionally groundwater has provided most of the water supplies of the city but the aquifer is becoming depleted and suffers from seawater intrusion; furthermore the utility only meets about half of the estimated water demand in the city. Tariffs are below cost recovery levels (USD 0.45 for production costs averaging USD 1.70); and there is strong political pressure not to increase them.

ONEAD was created in 2006 as a merger of water supply and sanitation authorities. It has a with a customer base of 39,000 connections and manages 55 boreholes (of which 13 were developed since 2013) and a desalination plant for saline groundwater. A WWTP has been in operation since 2014. Several projects are currently being implemented, as well as a new strategy geared toward private sector participation and sensitization of the population:

- The transboundary water project between Ethiopia and Djibouti, which is currently 85% completed and will provide 100,000 m3 of groundwater from Ethiopia per day through conveyance from July 2017 onwards (this is more than twice the amount currently provided by ONEAD). The water resources are free to be used by Djibouti for 30 years but Djibouti needs to pay for the cost of extraction and conveyance.
- The PEPER project (DBOT - 5 years project) of which the first phase will be completed in 2017.
- Finally, the Arab Social Development Fund is providing funding for a network rehabilitation project, with the first phase focused on the mains and the second phase on the distribution network.
ONEAD is looking for technical assistance for rainwater management as well as groundwater recharge. ONEE offered to provide its expertise through South-South cooperation between Morocco and Djibouti. It also encouraged ONEAD to establish a partnership with OCP which is established in Djibouti and may be able to provide its expertise.

The private sector perspective on desalination: Roundtable with desalination contractors and developers
Day 3: Wednesday, December 14, 2016
14:00 – 15:30

Emilio Ghiazza from Fisia Italpiianti commented that while RO prevails today, there is room for an increase of thermal desalination in the market. Hybrid plants are also very competitive (combining RO and thermal) - particularly for large installation, as they allow you to monitor water demand and energy demand. He highlighted that the best basis for selecting a technology for a plant is not necessarily a plant that's cheaper but that gives the cheapest tariff when taking into account capex and opex.

Miguel Sanz from Suez presented some of the innovations in the desalination market in recent years - including energy-efficient membranes developed in Masdar. He highlighted that it is important that both clients and the private sector agree on innovation.

Alonso Zapata from GS INIMA presented a number of PPP and BOT schemes in desalination with renewable energy, which could be interesting for Morocco and Algeria.

Domingo Zarza from Valoriza Agua listed a number of recommendations from the private sector for successful PPP desalination projects. He highlighted that EPC projects generally have lower profitability for the contractor - BOT/BOOT contracts are more convenient for both parties. He recommended to include some years of O&M in EPC contracts. He stressed that tight and rigid construction deadlines can be costly for the client - they are often too tight and politically motivated. If possible, the client should try to be flexible on construction deadlines in order to decrease the risk of overruns. The private sector is also often asked to acquire permits but often does not know these local procedures, which leads to delays. One way the client can help is by taking on or sharing this task to mitigate the risk of delays. The highest technical risks come from marine works and delays with electricity supply and connection, as well as water quality for intake. It is recommended to do pilot plant installations before the project.

Ronen Wolfman from Hutchison Water concurred with this observation and added that the government could use the time before the tender is launched to do a test pilot on some critical criteria (e.g. water quality; plant siting) to help shorten the time of construction later on. It is also helpful for the government to be flexible with regards to technology, and to define independent arbitration in case of disputes.
The private sector perspective on desalination: Roundtable with desalination contractors and developers
Day 3: Wednesday, December 14, 2016
16:00 - 17:00

Donors and civil society organization representatives from the Islamic Development Bank, MIGA, GWP Med, ACWUA, the Institut Mediterraneen de l’Eau, the World Water Council Conseil Mondial de l’Eau and IFC took part in the final roundtable of the workshop. They presented their respective projects in desalination:

- The Islamic Development Bank has already financed a desalination project in Bahrain.
- MIGA has supported 2 desalination plants in China and in Ghana.

Julie Carles from IFC explained the advantages of PPPs, which reduces the pressure on government budgets and transfers some of the risks to the private sector. In the MENA region, low cost recovery can hinder private sector participation. When tariff is low, there are two options for private sector participation: 1. Bringing concessional funds blend with IFC financing 2. Bringing World Bank financing into the project while ensuring progressive cost recovery.

Yann Burtin from MIGA presented several MIGA products that can be used in the water sector, including Political Risk Insurance and Credit Enhancement. Political Risk Insurance can cover small projects in conflict-affected countries (West Bank Gaza for 500,000 USD) up to large projects and can mobilize for long tenors of up to 15 years.

Konstantina Toli from GWP-Med presented some of the work it is involved in improving transparency and governance in the water sector and improving accountability and stakeholders’ engagement, both at the national level (in Albania, Lebanon, Tunisia...) as well as the regional level - to exchange good practices.

Hachmi Kennou from the Institut Mediterraneen de l’Eau is a professional network of public and private water services providers. It has recently set up a platform on water knowledge in the Mediterranean, and is setting up a European observatory on water which includes a theme on desalination.

Danielle Gaillard from the World Water Council gave some examples of its activities which include adaptation to climate change from a water perspective.

Khashman Khaldon from ACWUA highlighted some of the challenges unique to Arab countries, including the high level of water stress, the challenge of managing water in the
context of migration and refugees, as well as the need to build capacity and retain expertise in spite of brain drain.