

Regional Report

Regional Process Commission

Region: Mediterranean

Coordinator:

**Union for the Mediterranean (UfM) & Medi-
terranean Water Institute (IME)**



Union for the Mediterranean
Union pour la Méditerranée
الإتحاد من أجل المتوسط



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The report has been prepared under the guidance of the Union for the Mediterranean (UfM) for the political process and the Mediterranean Water Institute (IME) for the thematic process. Valuable support to both processes has been given by the Foundation Albert II of Monaco.

The report would not have been possible without the support of those organisations that coordinated the thematic sessions. To mention are

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- The Euro-Mediterranean Water Information System - EMWIS/SEMIDE
- The Mediterranean Regional Water Partnership of the Global Water Partnership - GWP-Med
- The Institut de Prospective Economique du Monde Méditerranéen - IPEMED
- The Mediterranean Cities Network - MEDCITIES
- Mediterranean network of Basin organisation - MENBO
- The Office National de l'Electricité et de l'Eau Potable - ONEE
- The Regional Activity Centre of UNEP-MAP, PLAN BLEU
- The TYPESA group of independent consulting engineering firms

The active participation of the Mediterranean Water Community during the 3rd Mediterranean Water Forum, held in Cairo from 22-24 January 2018, which was organised by Egypt's National Water Research Center (NWRC) supported by the UfM and IME, gave many positive impulses to the report.

Many thanks to everyone and also to all members of the Mediterranean Water Community not specifically mentioned here!

1. Executive Summary

The report describes the water situation in the Mediterranean Region with its many challenges, which differ substantially from country to country but include population pressure, political unrest, armed and other conflicts, environmental pressures, pollution of the Mediterranean Sea, climate change, extreme scarcity of fresh water resources and a not always adequate institutional environment for attacking water problems. Moreover regional governance is paid attention with key players such as UNEP-MAP and the UfM. The role of civil society is put forward.

It describes the thematic areas such as climate change, which may have a disastrous negative impact on available fresh water resources through precipitation reductions estimated to be between 10 and 40 percent at the end of this century, depending on the prediction method and the area under consideration. Climate change will be more severe in the West and in the South. The adaptation to this is a major governance challenge in which all possible efforts, institutional and financial are needed. Where climate adaptation is very much a national issue, the regional component is important for knowledge sharing and regional climate change modelling.

Access to sanitation has been improved during the last decades, but in particular in the southern part of the Mediterranean there is still much to be done, in particular in the rural areas. Where in the richer countries in the North, operation and maintenance is in general at a very acceptable level, in the southern and eastern part of the Region, a considerable part of the sanitation system is not fully operational, due to lack of financial resources, operational and maintenance staff capacities and inadequate management. Next to major investments needed, the region has to work on institutional strengthening, capacity building and developing sound financial models, including PPP.

An interesting development is the water-energy-food nexus approach. The Mediterranean Region is on average scarce in water resources, is a net energy importer of energy and net food importer as well. Sectoral approaches (water demand management, more food for water, solar and wind energy may solve part of the problem, but the nexus approach will make investments in new technology more efficient. Benefits from the nexus application are multiple: from security of sectors to social-economic and environmental, including job creation. The nexus approach is also particularly suited to be used for climate change adaptation.

As population grows and water needs for population, tourism and industry grow as well, more and more wastewater may be produced in future. Treating this wastewater and reusing it for multiple purposes such as irrigated agriculture, but also landscaping, industrial process water, cleaning, etc. will relieve the pressure on fresh water resources. Until now, treated wastewater is not used on a large scale (except in some countries like Cyprus, Israel, Jordan, Malta and Spain), but there is a growing interest to use this water for all kind of purposes. Simultaneous to wastewater reuse, there is also the issue of sludge,

which can, under controlled conditions, be a valuable resource to be recycled.

Wetland ecosystems can play an important role in integrated water management. They provide important ecosystem services which increase biodiversity and protect sensitive water resources in both quantitative and qualitative sense. Ecosystem development should therefore be a component of water management services. In order to achieve a fair pricing of ecosystem services, the cost of environmental degradation of such systems should be included in the pricing policies for every water use sector. Ecosystems are of great value for the fight against climate change through climate regulation, flood protection and carbon sequestration.

Sufficient and sustainable financing of public water services is crucial for human development and environmental protection in the Mediterranean region where there is a lack of data regarding financial flows. Planning should include climate change and water-energy nexus considerations. Capacity building is needed for governmental agencies to make projects bankable and attract financing from donors and their own governments. Moreover, civil society engagement in water management is essential and should include a wide array of stakeholders in any phase of a project. Private sector investment should be encouraged and properly regulated.

The report further describes the working group sessions of the 3rd Mediterranean Water Forum, held in Cairo from 22-24 January 2018. The results of the discussions in these sessions are a number of conclusions and recommendation, included in this report in Annex 3. Based on these conclusions and recommendations key messages have been formulated, presented in Chapter 6.3. The key messages cover all six thematic themes and the political dimension on regional cooperation. They contain message on regional cooperation, actions to alleviate the impact of climate change, how to implement the nexus approach more widely in the Mediterranean,

The key messages relate to the following issues:

- ▶ Strengthening of the cooperation between the main stakeholders involved in water sector in the Mediterranean region in coherence with the Water Agenda of the UfM approved recently in Malta;
- ▶ Improving the knowledge base on the thematic themes presented in the Forum, including capacity building on a number of issues and regional networking where needed; sharing of information for the common good.
- ▶ Emergence of regional projects in which countries mutually support each other on implementing innovative approaches for complex problems such as climate change, sanitation, wastewater reuse, water-energy-food nexus, ecosystem services and appropriate financing mechanisms.
- ▶ Stimulate knowledge transfer North-North and South-South and dialogue within as full participatory stakeholder involvement setup.



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The Mediterranean Water Community approached the 8th World Water Forum with a clear commitment to share experiences and gain from the related exchanges with other regions. A Position Paper elaborated in this framework has a dual purpose: to reflect on what has been achieved in the Mediterranean and what is needed further. Also it aims to communicate the key messages of the Mediterranean Region to the global water community, foster further collaboration to obtain tangible impacts, responding to the expectations and servicing the needs of people throughout the world.

2. Presentation

2.1. World Water Council

The World Water Council is an international multi-stakeholder platform organization whose mission is to mobilize action on critical water issues at all levels, including the highest decision-making level, by engaging people in debate and challenging conventional thinking. The Council focuses on the political dimensions of water security, adaptation and sustainability¹.

The World Water Council works towards increasing the awareness of high-level decision makers on water issues. It seeks to position water at the top of the global political agenda and to produce worldwide policies to help authorities develop and manage water resources, and encourage efficient water use. The Council endeavours to reach the whole political sphere: national governments, parliamentarians and local authorities, as well as United Nations bodies.

The World Water Council catalyses collective action during and in between each World Water Forum – the world's largest event on water. Organized every three years with a host country, the Forum provides a unique platform where the water community and key decision makers can collaborate and make long-term progress on global water challenges. The Forum brings together participants from all levels and areas, including politics, multi-lateral institutions, academia, civil society and the private sector.

The World Water Council tackles the many issues facing water security, and seeks to challenge convention and generate new thinking as a force for change. Together with members and other stakeholders, the Council explores areas where it sees the potential to increase the visibility of water. It seeks a more distinctive contribution to global water challenges by forming alternative approaches to emerging issues.

2.2. 8th World Water Forum

The World Water Forum is the world's largest multi-stakeholder platform, which brings together political leaders, practitioners and experts to share knowledge and experiences to learn from each other as well as to renew political commitments. The Forum consists of a three-year preparatory process, a one-week event and a synthesis phase.

The 8th World Water Forum, co-organized by the World Water Council (WWC) and Brazil, will take place in Brasilia from 18 to 23 March 2018.

¹ <http://www.worldwatercouncil.org/en/about-us>

The 8th World Water Forum will include four processes: Thematic, Regional, Political and Sustainability; as well as a Citizens' Forum and an Exhibition.

2.3. The Regional Process

Historically, a regional approach has always had a significant place in the World Water Fora. The justification for such a prominent role in the Forum is that regions share commonalities, both in terms of problems and solutions that may not exist at the global level and therefore should share experiences to learn from one another to further the goal of sustainable water resources management. This structure also allows for regions to acquire new knowledge through linking common thematic areas across regions.

It is the goal of the 8th World Water Forum Regional Process to not only align its activities and initiatives with the other processes of the Forum, but also to utilize the timing of this event to make progress towards the Sustainable Development Goals (SDGs), the Paris Climate Agreement and other international frameworks relevant to sustainable development.

2.4. Region

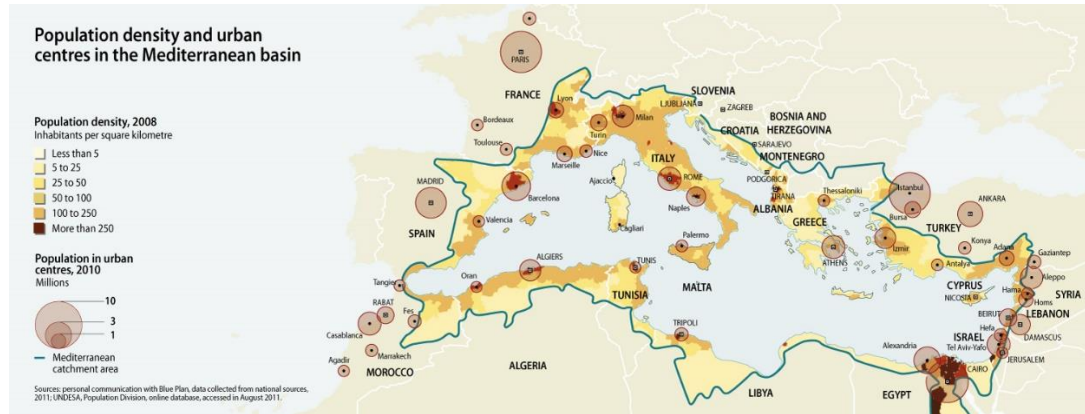
The Mediterranean Region includes the Mediterranean Sea and the countries bordering on it. There are eleven sovereign countries in Southern Europe that border the Mediterranean Sea (Albania, Bosnia-Herzegovina, Croatia, France, Greece, Italy, Monaco, Montenegro, Slovenia, Spain and Turkey) and nine countries in North Africa and the Levant (Algeria, Egypt, Israel, Lebanon, Libya, Morocco, Palestine, Syria and Tunisia), in addition to two island nations completely located in it (Malta and Cyprus). Traditionally Jordan and Portugal² and Mauretania, as member of the UfM, also count themselves as member of the Mediterranean community, bringing the total number of countries to 25.

Above countries cover a total area of approx. 8.7 million km² and represent a total population of approx. 533 million inhabitants in 2017³. However, for some larger countries, only a part of their area borders on the Mediterranean Sea and not all of their population can be considered living in the Mediterranean Region. It is estimated that roughly 250

² The Mediterranean Region is sometimes referred to as the "Old World where olive trees grow" (Braudel, 1996, *The Mediterranean and the Mediterranean World in the Age of Philip II*, Vol. 1).

³ All data are from the CIA World Factbook (<https://www.cia.gov/library/publications/the-world-factbook/geos/ts.html>); population data are estimates for July 2017.

million people live in the Mediterranean basin, the area draining towards the Mediterranean Sea⁴. An exact definition of the Mediterranean Region does however not exist.



The Mediterranean basin and its population. Source: <https://www.grida.no/resources/5900>

The Mediterranean Basin is thought to have been created by alternating convergence and recession of the relatively stable continental plates of Eurasia and Africa during the past 44 million years. The Region is still tectonically active. The terrain, including the sea bottom is extremely rugged; the difference between the highest mountain peaks and the deepest point of the sea bottom is almost 10,000 m. The topography of the land surrounding the Mediterranean Sea is varied and there is an extremely rugged coastline in its northern areas. High mountains and steep, rocky cliffs are common here. In other areas, though the coastline is flatter and dominated by desert⁵.

The climate in the Mediterranean Region is largely subtropical with hot dry summers and cool wet winters. Despite the relatively small area of the Basin of just over 2 million km², temperature and rainfall vary greatly throughout the Region, with the mean annual rainfall ranging from as little as 100 mm in some areas to over 4,000 mm in others. The climate is also generally considered to be harsher on the northern than the southern shores of the Mediterranean Sea⁶.

The Region is characterized by excessive human interference over many centuries. Having been occupied by humans for some 8,000 years, the Mediterranean Basin has been under human influence for far longer than any other biological 'hotspot'. The pressure from its population is causing severe degradation of the Mediterranean's natural environment,

⁴ European Environmental Agency, 2015. Mediterranean Sea region briefing - The European environment - state and outlook 2015. Updated in 2017 (<https://www.eea.europa.eu/soer-2015/countries/mediterranean>).

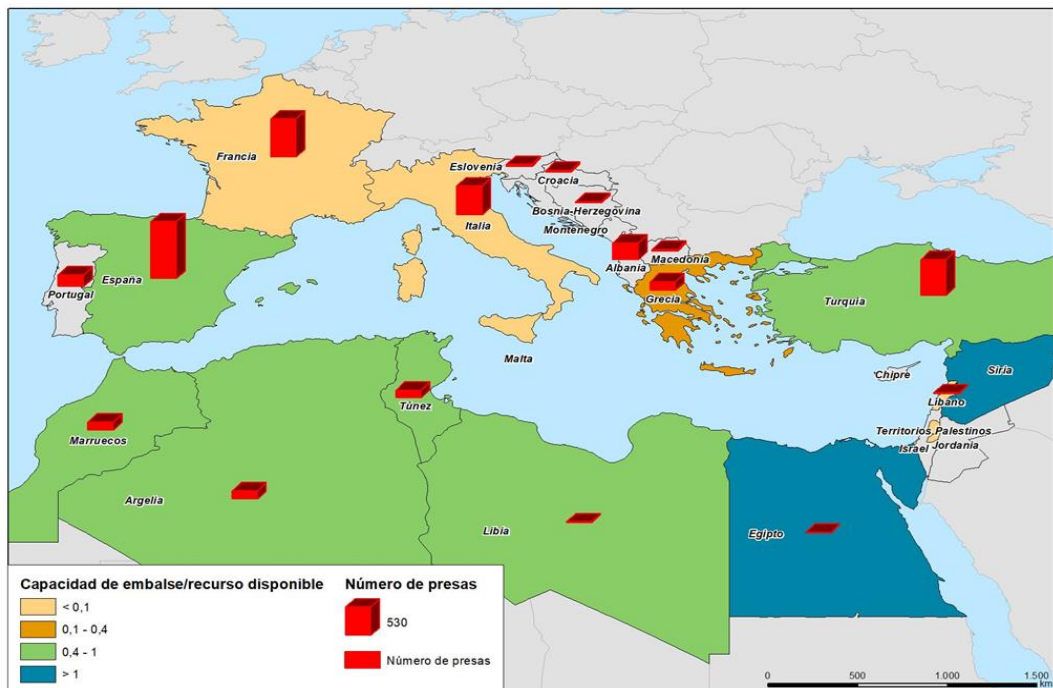
⁵ <https://www.thoughtco.com/geography-of-the-mediterranean-sea-1435529>

⁶ Blondel, Aronson, Bodiou and Boeuf, 2010. The Mediterranean Region: Biological Diversity in Space and Time. Oxford University Press Inc., New York.

and only five percent of the original habitat remains unaltered.

For centuries, the farming systems of the Mediterranean Basin have existed as a delicate balance between productivity and wildlife conservation. However, ancient practices have been abandoned in recent years in favour of intensive, industrial-scale methods. Deforestation, intensive grazing and fires have all led to the loss of habitat vital to endemic species. Development for the tourism industry has also placed a great deal of pressure on coastal habitats, with the construction of hotels and holiday homes resulting in many areas of coastline disappearing under concrete.

Freshwater ecosystems are under particularly high pressure, with the demand for water for crop irrigation approaching unsustainable levels. There are also more than 3,500 dams in Mediterranean rivers, permanently altering the flow regime and habitat of many species. Pollution, invasive species and climate change are all also impacting on the biodiversity of the Region⁷. The development of these infrastructures has been the logical consequence of having to face water resources scarcity in the region throughout history.



Dam capacity in the Mediterranean. Image: Courtesy of MENBO, based on data from Plan Bleu, IME, Jean Margat and Elisa Vargas

Natural water resources are relatively abundant in the Northern part of the Mediterranean.

⁷ <http://www.biodiversityhotspots.org/xp/hotspots/mediterranean/Pages/default.aspx>

near Region (although less in the coastal zones of the Basin) with approx. 3,700 m³/capita/year in 2015, but availability is giving a bleak picture in the Northern African and Levant part of the Region, leading to an average annual water availability there of 562 m³/capita, with all countries in that Region below the international water poverty line of 1,000 cubic metres annually per capita. The two island states in the Mediterranean Sea, Malta and Cyprus are below the international water poverty line as well. In particular countries like Jordan, Libya, Palestine and Israel suffer from low resource availability with an annual availability of 95, 112, 179 and 221 m³/capita respectively⁸. Malta (119 m³/capita/year) has very little resources as well, but compensates with desalination; more than half of its drinking water supply comes from desalination⁹.

In the eastern part of the Mediterranean, where water managers have exhausted all possible fresh water resources, ways to compensate for shortage of natural water resources are demand management, desalination and wastewater reuse. Israel compensates its natural water resources by both desalination and wastewater reuse; Jordan reuses most of its wastewater and has started desalination projects. Palestine will start desalination of sea water in the Gaza Strip soon and has recently accelerated its wastewater treatment and reuse programme. Demand management is being implemented by most countries in the Mediterranean with different success. According to the Plan Bleu Observatory¹⁰, between 1995 and 2005-2010, most of the countries achieved encouraging progress in terms of their efficiency in the various water use sectors. In Cyprus and Israel, the total water use efficiency today is higher than 80%. However, average Mediterranean water efficiency is still below 60 percent and in some countries further improvements are stagnating (i.a. Lebanon, Jordan, Palestine) or technically difficult to achieve (Israel, Cyprus).

⁸ Burak, Selmin and Margat, Jean. "Water Management in the Mediterranean Region: Concepts and Policies" in *Water Resources Management* 30: 5779–5797, 2016

⁹ <http://maltawaterassociation.org/index.php/portfolio-item/state-of-water-resources-in-malta/>

¹⁰ <http://obs.planbleu.org/en/factsheets/rural-ressources?limit=5&start=5>

3. Regional Approach

3.1. General Approach and Structure for the Regional Process

The Regional Process has as its core the development, analysis and presentation of case studies related to sustainable water resources management issues at the regional level. Following as a guide the Thematic Process of the Forum, the Regional Process incorporates local and regional perspectives throughout its own preparatory process as well as other processes and events related to the 8th Forum.

In the development and implementation of its activities, the Regional Process mobilizes the participation of all stakeholders, including water experts, politicians, high-level government officials, regulators and water utilities, water users, the private sector, donors, regional organisations, media, academia and civil society. A roadmap has been provided to guide the development of the Regional Process.



3.2. Regional Coordinators for the Mediterranean

For the Mediterranean region, the UfM Secretariat (UfMS) and IME have been designated as the coordinators and they are both responsible for guiding and coordinating the work done within the regional preparatory process.

Because of their specificities, UfMS and IME, have been implementing, with their Partners (networks, institutions and experts) the regional process for the Mediterranean through two components:

- UfMS has been coordinating the political and institutional component through an implication in the political process;
- IME has been coordinating the thematic component with the support of the working groups and the logistic and financial organization.

The following Projects labelled by the UfM, and currently ongoing¹¹:

- Capacity-building Programme on Water Integrity in the Middle East and North Africa. Stockholm International Water Institute (SIWI)¹²;
- Mediterranean Water Knowledge Platform (Med Water Knowledge). Office International de l'Eau/Institut Méditerranéen de l'Eau (OIEau/IME) ;
- Integrated Programme for the Protection of Lake Bizerte against Pollution. Government of Tunisia, Ministry of Environment and Sustainable Development;
- Overcoming Governance Challenges to the Mobilisation of Financing for the Mediterranean Water Sector (Governance & Financing for the Mediterranean Water Sector). Global Water Partnership-Mediterranean/Organisation for Economic Cooperation and Development (GWP-Med/OECD)¹³; and
- Desalination Facility for the Gaza Strip Project. Palestine.

The Mediterranean Regional Process has worked with the Regional Process Commission in a coordinated way with the Thematic Process Commission (TPC), the Political Process Commission (PPC), the Sustainability Group and the Citizens' Forum to contribute to the coherency and effectiveness of the overall program of the 8th World Water Forum.

3.3. Methodology

A Regional Design Group (RDG) has to be set up for the implement of the roadmap. The RDG construct the Regional Session Groups, which are tasked with organizing individual sessions at the 8th World Water Forum itself. These Session Groups are comprised of stakeholders from both within the RDGs as well as outside.

3.4. Mediterranean topics

A high priority was to have a strong link between the Regional and Thematic Processes for the 8th World Water Forum. Given that, both processes are working towards the same

¹¹ Annex List of the UfM-labelled projects in http://ufmsecretariat.org/wp-content/uploads/2017/05/2016-Annual-Report_-UfM.pdf

¹² The first phase of the project was completed in December 2017; a second phase is in preparation.

¹³ The first phase of the project was completed in December 2017; a second phase is in preparation.

goal of engaging stakeholders on topics of sustainable water resources management.

The proposed approach aimed to ensure close alignment between the Regions themselves. Each Region has to choose one (1) Topic under each of the six (6) main Themes from the Thematic Framework (so at least six (6) Topics). This would give many opportunities for similar topics chosen in Region for potential Interregional Sessions. These sessions will be organised at the Forum by interregional Session Groups.

8 th WWF Thematic framework	Responsible coordinator	Mediterranean Topics
1. Climate	CEDARE/ Plan Bleu	Climate change mitigation and adaptation
2. People	ENEE/ IME	Integrated sanitation for all – whole sanitation approach, sanitation chain, innovation
3. Development	GWP-Med/ Typsa	Nexus: water-energy-food-ecosystems
4. Urban	IPEMED/ MEDCITIES	Circular economy: Reuse in the Mediterranean and its impact on territories Urban reuse in Africa-Mediterranean-Europe” Axis: Territorial impact and search for a common strategy
5. Ecosystems	EMWIS/ Confederación Hidrográfica del Segura	Managing and restoring Mediterranean ecosystems for water services and biodiversity
6. Finance	MENBO	Finance for sustainable development

3.5. Proposed Deliverables from the Regional Process

Each Region has been asked to prepare the following in the preparation phase, during and after the 8th Forum:

1. Regional Process Roadmap: a roadmap/plan of work was required to ensure the timely achievement of important milestones leading to Brasilia 2018.
2. Regional Kick-off Meeting: a Kick-off meeting was held in Monaco on 11 July 2017, to launch the Mediterranean Regional Process.
3. Regional Wrap-up Meeting: the 3rd Mediterranean Water Forum (Cairo 22-24 January 2018).
4. Draft and Final Regional Reports: One of the main outputs
5. Session Design(s) and Framework: The Regional Design Groups will be required to work closely with the Session Design Groups to organize and structure sessions with a regional framework.

5. The Mediterranean Water Forum, the main step of the Mediterranean Regional Process

Initiated in Marrakech (2011, Morocco) and held subsequently in Murcia (2014, Spain), the Mediterranean Water Forum has been put forth as a regional event that brings together the main stakeholders in the Mediterranean water community.

This forum, to be organized prior to each edition of the World Water Forum, has the mission of mobilizing the water community around the Mediterranean focusing on the geopolitical, geo-environmental and geo-economic agendas related to water aspects directly and indirectly, in order to achieve the regional integrations and building synergies with the global Agenda on Sustainable Development.

Given its specificity as an inter-continental crossroads, a target region for water scarcity and a hot spot of the effects of climate change, the Mediterranean region is also a dynamic platform to a large number of solutions and experiences on water issues that can be highlighted during the World Water Forum. This Forum brought together the main stakeholders of the water community in the Mediterranean region to discuss on the progress of the water agenda.

It also benefitted from the convergence of priorities evidenced by the UfM Water agenda, which is a mandate contained in the UfM Ministerial Declaration on Water approved by Ministers gathered in Malta on 27 April 2017. Common priorities reflected both under the WWF and the UfM agenda responding to regional challenges include work on the water, food security, energy and ecosystem approach, on climate change adaptation and water, on water access and sanitation as well as on water, employment and migration, which takes the scope of work towards responding as well to socio-economic needs. Horizontal issues such as governance and financing of the water sector are key issues common to both approaches.

Launched in Monaco on 11 July 2017 with the support of the Foundation Prince Albert II of Monaco, the 3rd Mediterranean Water Forum was held in Cairo (Egypt) from 22 to 24 January 2018 with the title “Water Sharing & Cooperation: Future for the Mediterranean” under the coordination of IME and the Secretariat of the Union for the Mediterranean, with the support of the National Water Research Center from Egypt.

Held every three years and in alignment with the themes defined for the 8th World Water Forum, the 3rd Mediterranean Water Forum targets specific themes for the Mediterranean region, which are coordinated by the main stakeholders,

During the activities of the 3rd Mediterranean Water Forum, other major subjects and initiatives were discussed and debated, such as the UfM Agenda approved in Malta, the 5+5 initiative, Food Security, Water Policy/Water Security...

The 5+5 process in the Western Mediterranean is particularly relevant, as it achieved full consensus (Algiers 2015) in regard to a common Strategy for water resources management, an associated Action Plan (Marrakech, 2016), both approved during ministerial summits of the group, which have been the engine of the 2017 UfM process. The Strategy defines 13 priorities, most of them applicable to the whole Mediterranean, grouped in 3 main blocks:

- Enhancing Western Mediterranean country policies' convergence towards the general principles of a sustainable water policy.
- Fostering cooperation on regional interest matters.
- Promoting water management improvement.

The Action Plan includes around 60 projects to implement these priorities in the region, many of which have been proposed for the whole Mediterranean region, beyond the strict Western scope of the 5+5.

Furthermore, this 3rd Mediterranean Water Forum should contribute to putting water high on the political agenda at global, regional and a national level.

The main recommendations issued from the discussions during the Mediterranean Water Forum are the following:

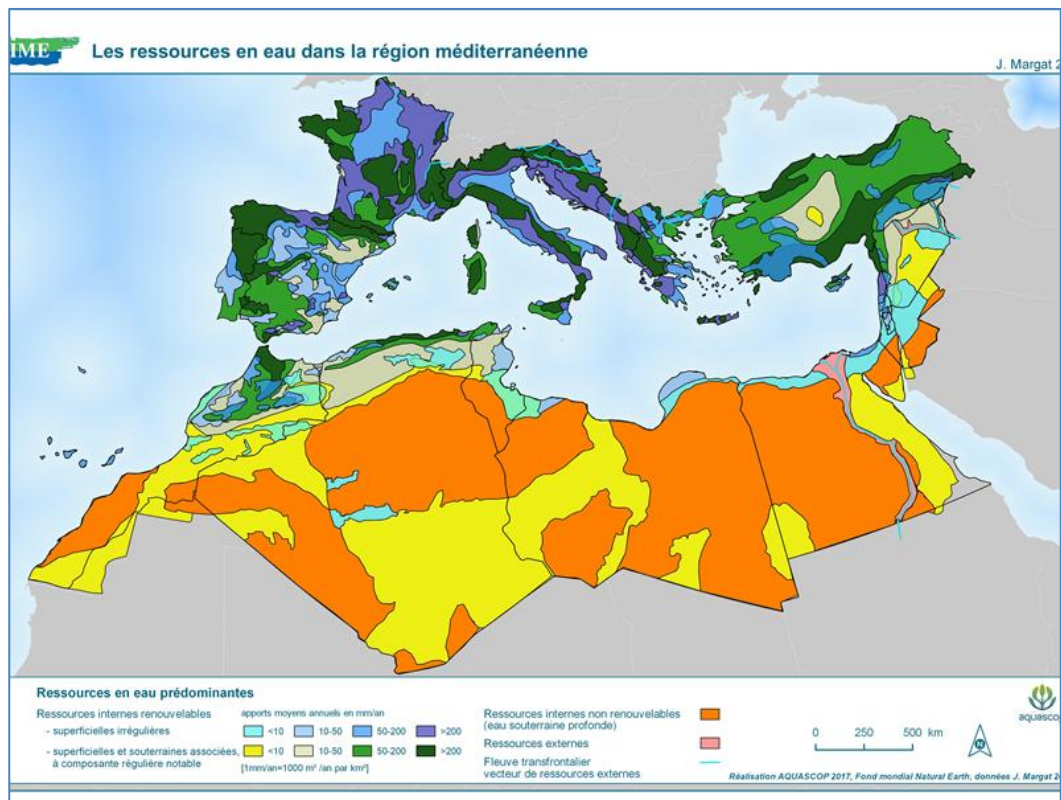
- Strengthening of the cooperation between the main stakeholders involved in water sector in the Mediterranean region in coherence with the Water agenda of UfM approved recently in Malta;
- Necessity of having sufficient knowledge based on water information sharing with the implementation of a regional governance adapted to the Mediterranean specificities;
- Emergence of regional projects which will be presented to the 8th WWF and which will be integrated into a future regional action plan.

The outcomes and priorities agreed upon will serve to significantly enhance the regional report prior to its presentation during the 8th World Water Forum.

4. Water Overview in the Region

4.1. Water Status in the Mediterranean Region

In 2015, the total available fresh water resources in the Mediterranean countries was approx. 1,217 billion m³ per year. Of this, 68 percent are surface waters and 32 percent are underground waters. The northern Mediterranean countries (European countries including Turkey) have a share of 83 percent of the total available fresh water resources although they have just 55 percent of the population of the Region, the Southern Mediterranean countries have a share of 11 percent and the Eastern Mediterranean countries 5 percent. Ninety-four percent of the water resources are internal, 6 percent external (mainly the Nile in Egypt and the Euphrat in Syria)¹⁴.



The unequal distribution between North and South and inside the Mediterranean countries is very well illustrated in the picture above¹⁵

The most water scarce country in the region is Jordan with a yearly availability of 95

¹⁴ Burak, Selmin and Margat, Jean. "Water Management in the Mediterranean Region: Concepts and Policies" in *Water Resources Management* 30: 5779–5797, 2016

¹⁵ IME, 2017. Etude sur la disponibilité et la qualité de l'eau en Méditerranée.

m³/capita. This scarcity is aggravated by the refugee crisis caused by the civil war in Syria; at the end of 2017, close to twenty percent of Jordan's population is made up of refugees. Jordan is followed by Libya, Malta, Palestine, Israel, Algeria, Tunisia, Egypt, Lebanon, Morocco and Syria. It should be noted in this context that in reality Palestine has even less resources than is indicated above, as the Israeli occupation only allows the Palestinians to exploit 20-30 percent of their available resources.

As was mentioned before, water resources are not only unequally distributed within the whole Region and in its sub-regions, but also inside the different countries, in particular in the southern and eastern Mediterranean countries. The observed water scarcity puts considerable stress on water management. In the eastern Mediterranean and the island states, but also in the south, most groundwater resources are severely overexploited, leading to exhaustion of aquifers and deterioration of their quality. Water stress is also growing because of the ever-increasing population. According to CIA World Factbook historical data¹⁶, average population growth in the Region is slightly less than 0.9 percent, 0.4 percent in the northern part of the Mediterranean Region, and 1.5 percent in the southern and eastern parts. However, the population growth in the coastal areas of the northern part of the Region is also around 1.5 percent, due to migration.

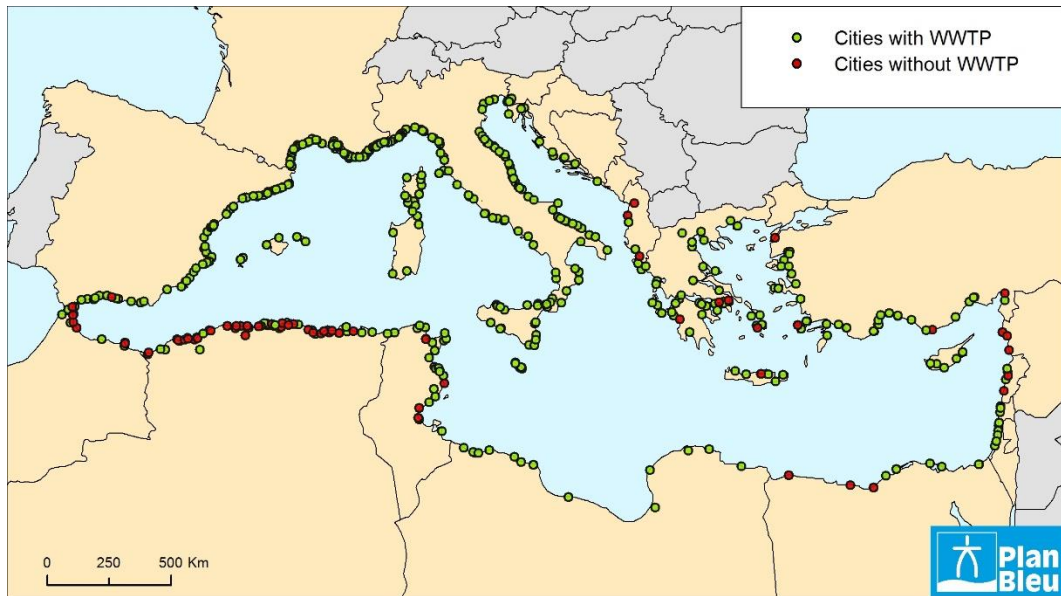
Water quality of land-based resources has been deteriorating over many decades. On the northern side of the Mediterranean Sea, lack of wastewater treatment, industrial pollution and inefficient solid waste management has deteriorated the quality of surface and groundwater over a long period. Over the last 10-15 years quality of surface water has improved, also due to the introduction of the EU Water Framework directive in the year 2000 and surface waters in the EU are much cleaner than 25 years ago¹⁷. It should be noted however, that groundwater quality did not improve significantly on average. In the southern and eastern Mediterranean – although there are large differences between the countries - pollution control is not always as well developed as in the North and regulations are in general not in place or not fully implemented.

In the northern part of the Mediterranean Region, the vast majority of cities has adequate wastewater treatment, in the southern part, the percentage of wastewater treated lags behind and most pollution comes from inefficient management of urban waste and chemical products. The next map¹⁸ gives an idea of the status of wastewater treatment of coastal cities. Please note that the map is based on 2010 data and the number of coastal cities in the southern and eastern part of the Mediterranean Region has increased since.

¹⁶ <https://www.cia.gov/library/publications/the-world-factbook/geos/ts.html>; averaged values for different sub-regions

¹⁷ <https://www.eea.europa.eu/soer-2015/europe/freshwater/keymessage-2015-01-19-2840834569>

¹⁸ GRID-Arendal - <https://www.grida.no/resources/5908>



Coastal cities with and without wastewater treatment in 2010¹⁹

Lack of wastewater treatment in the adjacent river basins also gives rise to pollution of the Mediterranean Sea and impacts the marine environment and the bathing water quality. On the other hand, most of the pollution from agriculture and (to some extent) industry comes from the northern part of the Mediterranean Region. Despite economic and technological advantages, the North still pollutes more than the South.

Water uses vary greatly from country to country. Overall, 52 percent of available water resources are being used for irrigated agriculture and the remaining for drinking water supply, industrial water and tourism²⁰. In the European part of the Region this is 46 percent, in the southern and eastern part of the Region this is 83 percent. The drier climate in this Region requires large quantities of water for irrigation. This is not the place to discuss differences country by country, but it is noteworthy to mention that there is a latent conflict between efficiency and energy use. The more efficient irrigation is conceived (drip irrigation, etc.), the more energy needs to be used for pressurising irrigation systems. At the same time it should be noticed that declining groundwater levels will also increase the energy footprint per cubic meter of water used²¹.

¹⁹ From: Horizon 2020 Mediterranean report; Toward shared environmental information systems; EEA-UNEP/MAP joint report; EEA Technical report No 6/2014; source of the map: Plan Bleu

²⁰ IEMed, 2010. The Water Issue in the Mediterranean. Editor Eugenia Ferragina.

²¹ A Daccache et al 2014 Environ. Res. Lett. 9 124014. Water and energy footprint of irrigated agriculture in the Mediterranean region.

In the first publication above, efficiency of irrigation water use in the Mediterranean Region is estimated at close to 60 percent. Efficiency for drinking water use is rather low as well; it is estimated at slightly over 60 percent. Interesting enough, improving drinking water use efficiency will reduce energy costs, while improving irrigation water use efficiency will most probably lead to a considerable increase of energy use. Improving water use efficiency, in particular in irrigation seems to be more complex than thought at first sight.

4.2. Governance

4.2.1. National policies and strategies

There is a divide among the northern and southern/eastern part of the Mediterranean.

Most of the northern countries are EU member states or are candidate members/potential candidates (Western Balkans & Turkey) and hence obliged to implement EU legislation or in the process to align to EU *acquis communautaire*. This means that they have to respect/consider EU legal requirements in their national policies and strategies related to water, climate change, environment, etc.

Water in the EU legislation is part of the environmental sector. EU environment policy aims to promote sustainable development and protect the environment for present and future generations. It is based on preventive action, the polluter pays principle, fighting environmental damage at source, shared responsibility and the integration of environmental protection into other EU policies. The *acquis* comprises over 200 major legal acts covering horizontal legislation, water and air quality, waste management, nature protection, industrial pollution control and risk management, chemicals and genetically modified organisms (GMOs), noise and forestry. Compliance with the *acquis* requires significant investment which can be supported by EU regional or enlargement funding, as well as by loans from the EIF's. A strong and well-equipped administration at national and local level is imperative for the application and enforcement of the environment *acquis*²², but standards differ. Considering the Nexus approach, agricultural and energy legislation also plays a role.

Countries from Southern and Eastern Mediterranean have strategies and policies in place referring to water, environment, agriculture and energy, among other, in line with national priorities and with international commitments, such as the Barcelona Convention, or Climate Change agreements. These countries thus do not have EU obligations as a required reference point for national legislation, but may contemplate EU policies as a potential model for their own. As is the case in European countries, strategies and capacities

²² From https://ec.europa.eu/neighbourhood-enlargement/policy/conditions-membership/chapters-of-the-acquis_en

to implement them are of varying quality; some-times, policies (what does one want to achieve), strategies (how this should be achieved) and action plans (concrete plans with actions, financial requirements and time line) could be better differentiated and structured. There is a strong demand from these countries for capacity building, in order to assist them in improving their governance capacity and be better enabled to implement strategies and action plans. It is interesting to see what the Mediterranean Strategy for Sustainable Development says on this in its brochure:

“National strategies have favoured supply-side policies through the construction of dams and boreholes. However, many dams in southern and eastern Mediterranean countries will lose most of their storage capacity because they are becoming silted up and few countries will still be able to exploit them in the long term. Aquifers, many of which consist of non-renewable fossil water, are being over-exploited or irreversibly degraded by saline intrusion.

Hydrological systems are deteriorating as a result of the degradation and over-exploitation of catchment areas and the disappearance of wetlands. The management of cross-border water re-sources is a potential source of conflicts.

Many or most Mediterranean countries are faced with several water-related issues: how to manage their scarce water resources sustainably; how to secure access to safe drinking water for population groups who do not yet have it; and how to accustom individual consumers to practices which save water.

The first challenge requires water demand management policies to reduce loss and misuse, the development of more added value through greater efficiency in irrigation and in the use of water in industry and urban areas; and the meeting of economic and social needs at reduced cost. It also requires the integrated management of catchment areas and wetland ecosystems and an increase in water supply, particularly through the development of non-conventional sources of water. The second challenge requires the achievement of the MDGs concerning access to safe drinking water and sanitation. The third necessitates the strengthening of partnerships with local water users and water management bodies and awareness-raising campaigns on how to save water.”

4.2.2. Regional aspects

Regional governance includes many partners, but two of them stand out: UNEP-MAP, primarily concerned with the quality of the waters of the Mediterranean Sea (and subsequently also what happens in the coastal areas), and the more recent Union for the Mediterranean (UfM), is an intergovernmental institution comprised of European and Mediterranean member states to promote dialogue and cooperation including on water and environment issues.

The United Nations Environment Programme (UNEP) is the international organization that

operates to protect the environment and promotes the sustainable use of natural resources. The specific MAP - *Plan for the Protection of the Marine Environment and the Sustainable Development of the Coastal Areas of the Mediterranean (UNEP-MAP)*, in which was adopted the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, or *Barcelona Convention*, is appointed to strengthen regional cooperation among 21 Countries bordering the Mediterranean Sea and the European Union²³

UNEP-MAP started in 1974, as part of the UNEP Regional Seas Programme. In 1975, the Mediterranean States and the European Community approved the Mediterranean Action Plan (MAP) as the institutional framework for cooperation in addressing common challenges of marine environmental degradation. MAP's initial objectives were to assist the Mediterranean Governments to assess and control pollution, as well as to formulate their national marine environmental policies²⁴.

Meaningful and lasting environmental protection is thereby linked to social and economic development. The MAP's focus widened gradually from a sectoral approach to pollution control to integrated coastal zone planning and management, as their prime directive for solutions.

In addition to national legislation implementing the Barcelona Convention and its Protocols, the Contracting Parties have also adopted a large number of strategies, action plans, programmes, and measures that facilitate and enhance the effectiveness of the legal instruments at the regional and national levels.

The MAP Programme of Work is designed to facilitate and promote the full implementation of the Barcelona Convention, its Protocols and Strategies, as well as the Decisions and Recommendations adopted by the Meetings of the Contracting Parties. The Programme of Work is prepared and implemented by the MAP Coordinating Unit with the assistance of the Regional Activity Centres.

UNEP-MAP is among many other outputs responsible for the Mediterranean Strategy for Sustainable Development 2016-2025, together with their Regional Activity Centre Plan Bleu. Most of the issues presented during the 8th World Water Forum for the Mediterranean region are on the action agenda of UNEP-MAP.

The Union for the Mediterranean (UfM) was launched in 2008 and is an intergovernmental institution bringing together the 28 European Union Member States and 15 countries from the Southern and Eastern shores of the Mediterranean to promote dialogue and

²³ <http://www.camp-italy.org/network-of-camp-projects-in-the-mediterranean-sea/unep-map>

²⁴ <http://web.unep.org/unepmap/>

cooperation. UfM's mission is to enhance regional cooperation, dialogue and the implementation of concrete projects and initiatives with tangible impact on our citizens, with an emphasis on young people and women, in order to address the three strategic objectives of the region: stability, human development and integration²⁵.

In April 2017, the ministers in charge of Water from the 43 UfM members agreed to develop an UfM Water Agenda to further enhance regional cooperation on water. Ministers recalled the unique features of the Mediterranean region, which makes it particularly vulnerable to water scarcity and climate change. The UfM Water agenda is expected to lead to a consensual regional water policy framework that offers a means for substantial and measurable positive impact towards sustainable livelihood in the region. It will also contribute to meet the UN Sustainable Development Goals and targets, in particular SDG 6 on Water, as well as address the adverse effects of climate change in the region.

Ministers agreed that the new policy framework will help UfM Member States to implement sustainable and integrated water resources management in a comprehensive manner, thus promoting progressive integration, synergies and coordination among the water and other inter-linked sectors.

The UfM Water Agenda will be elaborated by the UfM Water Expert Working Group (WEG) under the leadership of the UfM Co-Presidency and the support of the UfM Secretariat, and will include:

- A Work Programme to provide a suite of recommendations, proposals and initiatives helping UfM members to apply Integrated Water Resources Management approaches and to ensure a better coordination with other sectors in the UfM region.
- A Financial Strategy to support the implementation of the UfM Water Agenda, promote the progressive deployment of financial resources and facilitate access to the existing financial resources across the UfM region.

Ministers recalled that access to safe drinking water and sanitation is a fundamental human right, key to sustainable social and economic development and has a crucial role in human health. They highlighted the importance of supporting comprehensive plans and projects in UfM countries that are suffering from water scarcity, which in some cases is exacerbated by refugee and migrant in-fluxes as well as other emerging factors.

4.2.3. Civil society

Civil Society Organisations (CSOs), defined as all non-State, not-for-profit structures, non-partisan and non-violent, through which people organise to pursue shared objectives and

²⁵ <http://ufmsecretariat.org/>

ideals, whether political, cultural, social or economic are active in the whole Mediterranean Region in water and environment sector

Civil Society is usually organised through Non-Governmental organisations (NGOs) that, in the Mediterranean Region, play an important role in water management. There are global/regional NGOs, such as i.a. Friends of the Earth, the Stockholm International Water Institute - SIWI, the World Wide Fund for Nature - WWF, the Mediterranean World Economic Foresight Institute - IPE-MED and to some extent multi-stakeholder networking organisations (including also governments) such as the Global Water Partnership - GWP, the Water Supply and Sanitation Collaborative Council – WSSCC, and the International Union for the Conservation of Nature - IUCN, which play a role in Mediterranean water issues. Moreover there are many national NGOs related to Water and Environment, both in Northern Mediterranean countries as well as in the Southern.

NGOs representing Civil Society are the watchdog for establishing and implementing governmental policies, strategies and actions and at the same time develop initiatives that influence policy-making from the perspective of civil society or invite governments to be accountable for their actions. Civil Society NGOs are appreciated in their countries for assisting development, but not always for their political interventions.

CSOs have played a role in incorporating the human right on access to safe drinking water and sanitation into service provision and regulation through a participatory multi-stakeholder process. With regards to SDGs, there is general consensus that partnerships with Civil Society should play a crucial role in their achievement, but this partnership is not yet well developed in all countries.

With regards to IWRM, the emphasis should shift from purely economic considerations towards sustainability and social justice. CSOs can play an important role in that. CSOs can also play a crucial role in awareness, for instance on the costs of water supply and sanitation as they are close to the population and trusted. Moreover, CSOs can play an important role in community water management which becomes of increasing importance in all of the Mediterranean Region.

There are enormous benefits from involving CSOs in water management and governments should, where this is not yet the case, establish policies on how to actively involve CSOs in dialogue on policy, strategy and action issues. Involvement of CSOs will increase transparency and accountability of decision-making, increase the sense of ownership and trust and create a collective vision on managing water resources.

4.3. Mediterranean Thematic Issues

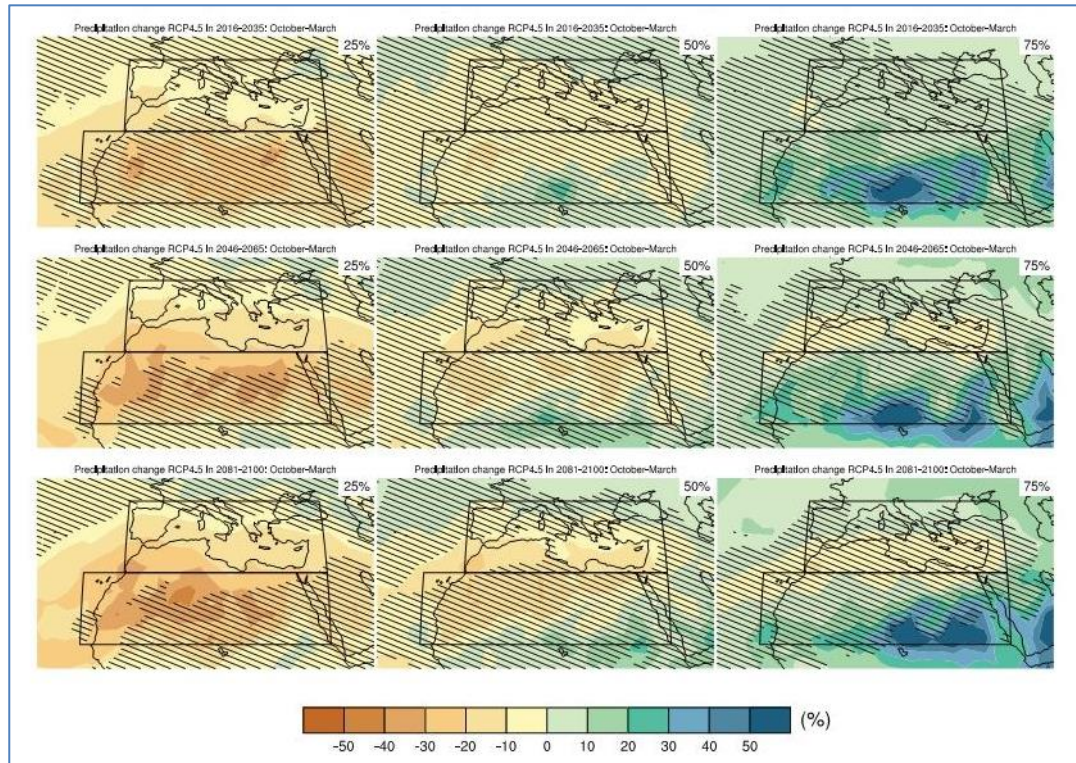
4.3.1. CLIMATE: Water and adaptation to climate change

The Mediterranean Region faces many climate change challenges, with projected increase

in temperature, decrease in precipitation, and more frequent extreme events (floods and droughts). These climate change effects will significantly impact the water sector and multiple economic sectors, including vulnerable people, assets and food security. There is a need to develop appropriate climate-smart water policies and practices to build climate resilience to lower the risks. Many Mediterranean countries have already or are in the process to develop adaptation plans and strategies. However, it remains challenging to include measures to climate-smart water security. Policymakers should be fully aware of the latest scientific knowledge in managing risk and uncertainty for climate resilience and be capable of utilizing those scientific findings to make informed decisions to embrace sound policy instruments to support climate change adaptation. Technology transfer to make climate-related water information available is essential. Policy instruments for climate-smart adaptation in the water sectors should investigate various options including desalination, groundwater recharge, wastewater reuse, green water management, water demand management and planning for less future water and extreme events. Innovative financing mechanisms should also be sought.

The Mediterranean basin is one of the world regions representing a major vulnerability to the impacts of climate change because of its natural and anthropogenic features. Relying largely on successive work of the Intergovernmental Panel for Climate Change (IPCC) and a variety of models, a larger number of national and international studies on climate change and its components in the Mediterranean Region have been made. They give a quite convergent and up-to-date picture. Not counting for the impacts of measures adopted by COP21, an increase in annual mean temperatures in 2081-2100 may be expected of 2-3 °C or even 5 °C (depending on the model being used) and heat waves would be more frequent. Reductions in average annual rainfall are expected in the order of 15-30 percent at the end of the 21st century, with a more marked zonation (North/South gap more pronounced) and a more contrasting seasonality with aggravated summer droughts. The IPCC 2013 report²⁶ states that in the Mediterranean: "an intensification of extreme precipitation and decrease in precipitation falling in the East of the Mediterranean during storms may be expected.

²⁶ IPCC, 2013. Climate Change 2013: The Physical Science Basis (<http://www.climatechange2013.org/>).



Predicted change in the amount of precipitation, in terms of percentage, for different time periods and different probabilities²⁷

The impacts of aforementioned climate changes on resources and water needs are tremendous. At the end of the twenty-first century, the 'blue water' could be reduced by 20-40 percent on average. Changes in the regimes of water courses are more difficult to predict, but the low water levels, i.e. summer water resources, will be without doubt the most impoverished. Apart from blue and green waters average reductions, drought spells will become more frequent and severe, which will made it more difficult to balance with increasing demands of agriculture and drinking water needs of the population and tourism. Due to reduced dilution, the risk of pollution of surface waters will increase and groundwater recharge will be of less quality. Loss of evaporation from reservoirs will increase and groundwater mining of strategic resources will be carried out over much shorter time periods.

Competitions between uses or regions (upstream/downstream), including between human use and conservation of aquatic ecosystems, are likely to be more widespread, frequent and conflicting. External sharing resources are likely to be more used in upstream countries, rivalry, and even conflicts may follow. At the moment it is still unclear what will

²⁷ IPCC, 2013. Climate Change 2013: The Physical Science Basis (<http://www.climatechange2013.org/>).

happen with the Nile; climate and rainfall predictions are unclear for the tropical region that generates most of the Nile water resources.

In the 3rd Mediterranean Water Forum held in January 2018 in Cairo, a number of interesting case studies have been presented that highlight Climate Change issues for the Mediterranean territories:

- *A new approach for assessing high return period floods regarding climate change: a case study in a Mediterranean basin.* The presentation describes a new methodology that includes physical terrain modelling and the shape of the storm and orographic effect. The case study which has been applied is the Gulf of Valencia which has a strong orographic component. The predicted flash floods are more intense than those obtained by classical statistical methods.
- *Climate change impact on water resources and adaptation in Spain*, highlighting that in Spain the climatic projections and hydrological simulations²⁸ show a significant decrease of water resources and a greater frequency of droughts. For the year 2033, a reduction in annual runoff of 12 percent is forecasted. It is proposed to adapt river basin management plans to these findings and improve the consistency of their programmes of measures with the impacts of climate change.
- *Contribution du Service Public de l'Eau de Marseille aux Objectifs de Développement Durable : une démarche de solidarité climatique.* The presentation states that water service providers need to integrate energy issues in the management of their services and optimise their operations in this sense. It also states that water service providers need to engage more in ecosystem services with the aim to preserve and protect the needed water resources.
- *Smart Management for the Impacts of Extreme Hydrological Events*, highlighting the development and implementation of a climate data management system in Egypt's Water Resources Sector. It includes real time monitoring, predicting the future status of climate and the preparation of a Decision Support System that relates climate change to irrigated areas. A pilot area has been developed in the Nile Delta, to which the methodology is applied, predicting an 8-9 percent increase in water needs (example cotton), depending on the climate change model used.
- *Eau et adaptation au changement climatique dans le bassin Rhône-Méditerranée.* The presentation presents the strategy and plan to cope with climate change. The adaptation strategy has three axes: retain water in the soil, fight against the wasting of water and give space to a good functioning of the environment. The strategy has been implemented but needs to be reviewed.
- *Potential Adaptation and Mitigation Measures in Palestine.* The presentation discusses the impact of climate change on Palestine. Adaptation measures for in-

²⁸ EDGE project of COPERNICUS Climate Programme of UE; <http://edge.climate.copernicus.eu/>

creasing water availability could be achieved by the following actions: (i) Promoting efficient use of existing water resources by imposing water conservation measures; (ii) storm water harvesting in major wadis; and (iii) artificial recharge of groundwater by infiltration of stagnant runoff water.

In the subsequent discussion among Mediterranean Water experts, a number of recommendations were made that can be found in the Annex to this report. The recommendations led to a number of key messages that are presented in Chapter 4.

4.3.2. PEOPLE: Integrated Sanitation for all - Whole sanitation approach, sanitation chain, innovation

The countries around the Mediterranean have exceptional natural resources whose preservation has been a priority shared by the riparian countries and the United Nations program for the environment (UNEP). The natural environment, in this case water resources, face increased pressures from population growth and the concentration of people in urban areas, the development of irrigated agriculture and other economic sectors such as industry and tourism. These pressures on water resources are also aggravated by pollution mainly from terrestrial origin and often caused by insufficient sanitation in particular in the coastal areas.

Improved access to sanitation is one of the Millennium goals for development (MDGs) and selected as an indicator in the Mediterranean Strategy for Sustainable Development 2015-2030²⁹, without mentioning concrete quantitative objectives. The report mentions that access to sanitation has been improved between 1990 and 2015. Data from the CIA Factbook show that in the Mediterranean area, almost 28 million people are still without access to improved sanitation³⁰; more than 26 million live in the southern and eastern part of the Mediterranean Region.

According to the GRID-Arendal website³¹, in 2013, 63 percent of coastal settlements in the Mediterranean Basin with more than 2,000 inhabitants operate a wastewater treatment plant. Secondary treatment is mostly used (67 percent) in Mediterranean treatment plants, while 18 percent of the plants have only primary treatment³². It is estimated that the situation has improved since.

²⁹ UNEP/MAP (2016). Mediterranean Strategy for Sustainable Development 2016-2025. Valbonne. Plan Bleu, Regional Activity Centre.

³⁰ Improved sanitation - use of any of the following facilities: flush or pour-flush to a piped sewer system, septic tank or pit latrine; ventilated improved pit (VIP) latrine; pit latrine with slab; or a composting toilet.

³¹ www.grida.no/resources/5908

³² Data from UNEP/MAP/MED POL and WHO 2010



Jordan, As Samra wastewater treatment plant. Image courtesy of GDF SUEZ / ABACAPRESS / Lyons Bill.

Countries of the northern Mediterranean, members of the European Union, generally have a quality sanitation service in terms of rates of coverage and treatment of municipal and industrial wastewater. The EU Directive on the treatment of urban waste water as well as of other European instruments related to the fight against pollution and the protection of the environment were major legal tools that have pushed most countries of the Mediterranean area to upgrade their infrastructure for collection and treatment of wastewater through own funds or benefiting from EU funds. The general rate of compliance with aforementioned Directive is estimated at almost 90 percent. In the southern and eastern parts of the Mediterranean Region, sanitation has been steadily improving over the last decades. However, wastewater treatment lags behind. Recent data are not readily available, but estimates are that less than 50 percent of collected wastewater is treated, although this number is growing rapidly, due to large investments in wastewater treatment during the last decade. Some of these countries have engaged since the beginning of the century on ambitious national plans for the sanitation sector which have proved their effectiveness as in Tunisia, Morocco, Egypt and Palestine recently.

Financing of wastewater collection and treatment remains an obstacle. Funds are available from the national and donor budgets, but it is not always easy to collect many for operation and maintenance of wastewater collection and treatment. As a result, particularly in the southern part of the Region, a significant part of wastewater treatment plants lack maintenance and are not functioning well.

Added to that comes that due to population growth and rapid urbanisation, some wastewater treatment plants, built one or two decades ago, run out of capacity and are malfunctioning. Moreover, some countries in the Eastern Mediterranean are facing difficulties associated with population displacement as a result of wars and political instability in the countries concerned. Water supply, sanitation and the treatment of wastewater from refugees in the camps, informal human settlements, and communities of the country

Although sanitation services are generally affordable for the population in the southern and eastern Mediterranean, the lack of a proper institutional framework may be one of the main reasons impeding better access to sanitation services. In addition, the mobilization of financing was for some time also a major constraint for the development of adequate infrastructure for the collection and treatment of wastewater. Public-private partnerships could improve wastewater services, but their implementation faces legal, financial and cultural obstacles.

To ensure widespread access to the sanitation service, it is also necessary that all public and private stakeholders and the various stakeholders are involved. Local authorities should also be involved and empowered in a context of decentralization process, given that sanitation is a local issue which should find appropriate responses to the context of the local territory. There are successful examples of local involvement in a number of southern Mediterranean countries, for instance Morocco, Egypt, and Palestine. Stakeholders include local operators of existing systems, but also the population at large, who at the end will have to pay for adequate sanitation services.

In the 3rd Mediterranean Water Forum held in January 2018 in Cairo, a number of interesting case studies have been presented that highlight the issues on improving sanitation in the Mediterranean territories:

- *Waste Water Treatment Plant Sludge Strategy in Mediterranean European Countries and Maghreb Region. Treatment and final Destination.* The presentation describes Águas de Portugal, a holding company founded in 1993, its responsibilities, functions and international activities. It discusses the technical solutions for the sludge problem by greenhouse drying as a form of solar drying, applicable in all Mediterranean South and East countries.
- *Current status of WW treatment, Guidelines, Regulations and Standards for Reclaimed water and Reuse in Jordan.* The presentation gives a comprehensive overview of the wastewater situation in Jordan, including laws, regulations, water strategies and policies. It shows a number of practical examples of wastewater treatment and reuse in Jordan.
- *Sanitation Services in Egypt.* The presentation gives an overview of the Water and Wastewater Sector reform; strategies for sanitation service areas; rural sanitation status & watersheds; sustainable management goals; and the current status of sanitation services. For rural sanitation, Egypt uses a clustering approach to achieve a certain economy of scale in wastewater treatment. The presentation

also discusses wastewater reuse; over 90 percent of treated wastewater returns to surface water bodies. A positive picture is given of the achievement of SDGs which complies with the SDG indicators.

- *Wastewater management in Tunisia.* The presentation gives an overview of the mission of the national sanitation agency ONAS and describes its achievements since its establishment in 1974. It gives a very extensive overview of all aspects of wastewater management in Tunisia, including i.a. investments, wastewater reuse and private-public partnerships.
- *Sanitation Development in Morocco.* This presentation gives an extensive overview of wastewater management in Morocco, data on wastewater collection and treatment coverage and institutional and financial aspects. It gives a picture of ambitious targets and a rapid improvement of urban and rural wastewater management. Morocco has made sustained efforts to improve the sanitary conditions of urban agglomerations and to protect the environment through major projects in the field of sanitation.

In the subsequent discussion, Mediterranean Water experts concluded that the majority of Mediterranean countries have made sustained efforts to improve the sanitary conditions of urban agglomerations and to protect the environment through major projects in the field of sanitation. Many of these countries have developed national strategies and programs to improve and set up sanitation infrastructures since the 80's of last century. These efforts and strategies are implemented in compliance with SDG 6 "Ensure access to water and sanitation for all". They are currently directed towards increasing the number of people having access to improved sanitation. In order to achieve SDG 6, the process has to be accelerated particularly in the rural areas by sharing best and adapted practices from prior experiences.

The improvement of sanitation systems offers opportunities to have more treated wastewater available as a nonconventional resource that can contribute to mitigating local water shortage and guaranties a sustainable development. The private sector could contribute to develop appropriate technologies, and participate in managing and financing sanitation and reuse projects.

More efforts should be made concerning the management of WWTP sludge, mainly through the implementation of sludge strategies for the management, treatment and final destination as a national issue, rather than a local challenge. Sludge should be considered as a valuable product in a circular economy context, to the detriment of landfill solutions.

A number of recommendations were made that can be found in the Annex to this report. The recommendations led to a number of key messages that are presented in Chapter 4.

4.3.3. DEVELOPMENT: Nexus water-energy-food-ecosystems

Water, food, energy and ecosystems are essential for human well-being, poverty reduction and sustainable development. They are interlinked through a nexus of natural, institutional, economic and social frameworks. The Water-Energy-Food-Ecosystems Nexus approach aims to facilitate enhancement of water, energy and food security while preserving ecosystems and their functions and increasing climate resilience, by reducing trade-offs and shifting towards more sustainable consumption patterns while increasing efficiency, building synergies and improving governance across sectors.

Water and Energy are strongly interrelated and becoming increasingly linked as the water scarcity in the Mediterranean Region increases. In the water value chain, energy is required in all segments and energy is used in almost every stage of the water cycle. Also, water and energy are linked with food production and environment/ecosystems, as the consumption of food, water and energy impacts ecosystems and natural resources. The necessities of these resources are increasingly being affected by a number of factors: population growth and mobility, economic development, urbanisation, technical and technological changes and climate change. All those factors are very relevant in the Mediterranean Region, with its endemic water scarcity, its irregular allocation of rainfall in time and space and its distribution of population, more concentrated in the coastal areas. Climate Change and migratory movements are drivers of paramount importance, as they will exacerbate the current imbalances of the Region. In this context an ineludible challenge has arisen to face the predicted significant shortfalls in water, energy and food in the future while preserving the ecosystems: this is the Nexus challenge.

While significant progress has been made in the Mediterranean region to improve the efficiency of the interrelated water-energy systems, primarily through efforts for implementing innovative solutions, many problems are still lingering: weak governance systems, limited awareness, distortions from subsidies and unsustainable investment shows the need to build on more innovative solutions to address water, energy and food solutions. And despite cross-sectoral integration forming a constant effort, related challenges have so far been addressed mostly within silos. If the sustainability of our water, energy, food and ecosystems are to be simultaneously secured, decision-makers, including those responsible for only individual sectors, need to consider their choices' and decisions' broader cross-sectoral consequences. The increasing urbanization of the Mediterranean Region and the migration movements are requiring transferring water from wet areas to populated ones, increasing the energy consumption. Also, the rapid growth of the urban population increases the energy consumption in terms of water treatment and distribution.

On the other hand, an important development has been achieved in terms of increasing the energy efficiency in desalination plants, with values closer or even less than 1 kWh/m³. Also, advances have been made in terms of re-valuing urban waste in WWTPs, to the point

of generating more energy than needed for wastewater treatment. The specific conditions of the Mediterranean weather makes the Region appropriate for developing renewable energies. Combination of solar and wind energy with hydropower pump-storage systems have been proved as a solution to provide regulation to the nowadays still unregulated renewable energy sources. This solution is especially interesting in the Mediterranean islands, where conventional energy sources based on carbon are more difficult to implement.

The Food element is also of great relevance in the Mediterranean context of the nexus, with agriculture being the major water consumer in the region, water being a key-stone for the entire agro-food supply chain and energy required to produce, transport and distribute food. It is noted that globally agriculture accounts for 70 percent of total freshwater withdrawals, while about 30 percent of the total global energy is used by the food sector.

The scenarios expected taking into account main drivers as Climate Change, population movements, development (especially in the South of the Mediterranean Region) and cultural and technological changes will increase the competition for resources between different sectors, with an unpredictable impact on the environment. Technological solutions will not to solve this situation by themselves, so the Nexus approach should be included as part of sensible policies that encourage cooperation among different actors to tackle existing and emerging challenges Image: Courtesy of GP-Med

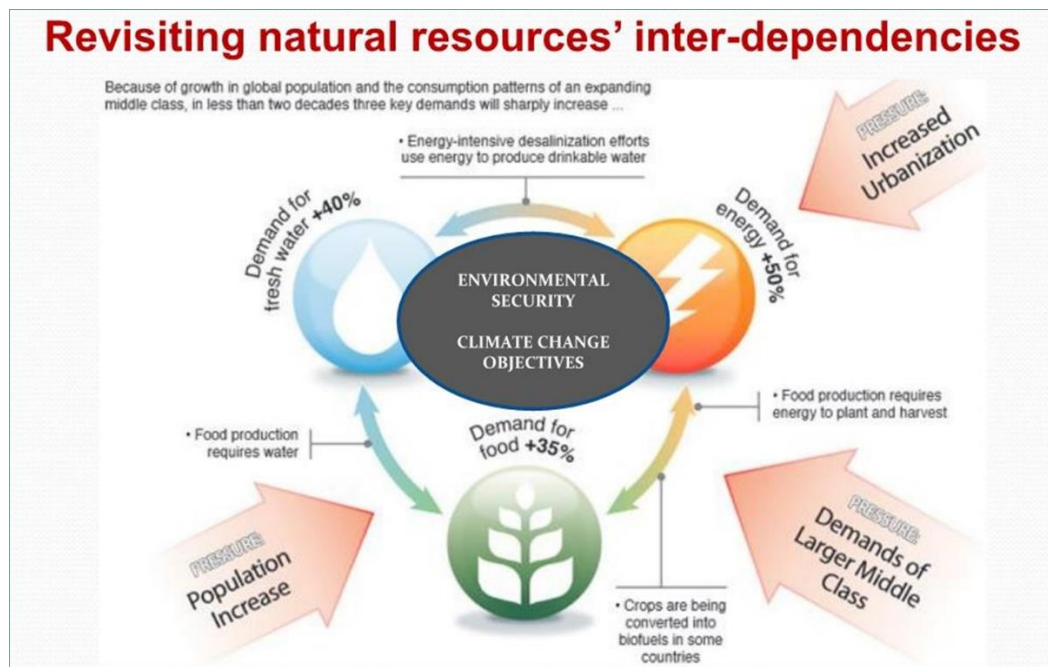


Image: Courtesy of GWP-Med

The challenge could be approached by gaining a better understanding of the Nexus framework and identifying interrelations and links at different scales. Stakeholder involvement would ensure that the understanding fully covers all important aspects. Quantitative and qualitative indicators should be developed to evaluate the above mentioned links and interrelations. Models should be developed to support the analysis of the nexus. Impulses should be created at the scientific/technological level (improvement of water and energy efficiency), at the policy level (revision of existing policies and legislation) and at the social level (stakeholders dialogue to create effective frameworks at a governance and institutional level, as well as education and capacity building).

Confirming the above, the following has been extracted from the position paper “A frame for a comprehensive understanding of Water-Energy-Food Nexus” (3rd EMEG Meeting – Malta, 30 September - 2 October 2015)³³: *“During the Davos Summit, The Global Risks 2011 report, issued by the World Economic Forum (WEF, 2011), brought to political attention, and for the first time, the risk correlation between the water, energy and food sectors. Later on, the interdependencies between water, energy and land resources became the focus of many global and regional conferences and meetings held in preparation for the United Nations Conference on Sustainable Development (Rio+20) held in June 2012 (UN, 2012). In particular, the Bonn 2011 Nexus Conference (held in November 2011), “The Water Energy and Food Security Nexus – Solutions for the Green Economy”, organized by the Federal Government of Germany, was a major milestone to place the nexus perspective on the international agenda (SEI, 2011). More recently, the Bonn 2014 conference, “Sustainability in the Water-Energy-Food Nexus” (GWSP, 2014), emphasized the need for coherence of cross-sector policy efforts and cross-border cooperation for jointly improved efficiency as a successful strategy to achieve environmental sustainability. The conference called for the following Actions: 1) Responsible governance of natural resources; 2) Broad involvement of stakeholders to collaboratively work toward sustainable development; 3) Need to expand financial, institutional, technical, and intellectual resources for nexus research”.*

The countries of the Mediterranean basin, and within their collaboration in the framework of the Union for the Mediterranean, are well aware of water, energy, food and ecosystems challenges. A Nexus approach to sectoral management, through enhanced technical assessment, policy dialogue, governance improvements, investment mobilization, replicable applications, collaboration and coordination, is necessary to ensure that co-benefits and trade-offs are not only considered but also that appropriate safeguards are put in place to mitigate their detrimental effects.

Because of this multiplicity of conceptual expansions, the Nexus represents a promising

³³ <http://www.medspring.eu/sites/default/files/311780-MED-SPRING-3rd-EMEG-Nexus-Position-Paper.pdf>

vehicle for promoting considerations on cross-cutting issues (e.g. gender, stakeholder engagement, rights, poverty, etc.). The Nexus can assist in the efforts to further mainstream these issues in addition to its pivotal role in promoting green job creation.

Taking into account the above, and as a relevant milestone in the preparation process of the 8 World Water Forum of Brasilia, the 3rd Mediterranean Water Forum was held from 22 to 24 January 2018 in Cairo (Egypt). A dedicated session on “Development: Water-Energy-Food-Ecosystem Nexus” (Working Group 3) was organised with objective to shed light on the context and the challenges of applying the nexus framework in the Mediterranean context, while suggesting decision support tools for prioritizing solutions at different geographical scales based on nexus analysis and assessment. In this sense, an interplay of selected case studies (based on existing and ongoing work at national and transboundary levels) and a regional knowledge and experience sharing, where exposed to identify tangible recommendations for actions, including the demonstration of technology transfer options, as applicable::

- *L’Expérience de Télérélevé de la Société des Eaux de Marseille de l’Eau à l’Energie.* The presentation highlighted how smart technologies could be implemented to improve the management of water and energy networks, resulting in increasing efficiency and a significant reduction in both water and energy losses. The experience of the airport Marseille Provence was given as an illustrative example.
- *Role of small Dams towards achieving sustainable development.* The presentation discusses the advantages of developing hydraulic schemes based in several small dams in large rivers versus large dams. Small dams could minimize the already known negative impacts of large dams (basically referred to environmental and socio-economic impacts) and could fit better in the nexus approach under certain circumstances.
- *The use of solar energy in the desalination of water - Case Ben Guerdene desalination plant in Tunisia.* The presentation offered an overview of the National Company of Exploitation and Distribution of Waters (SONEDE) water and energy policies. Due to high energy costs for water supply (including increasing desalination), SONEDE has been rethinking its energy use since early this century. As a result, energy use for drinking water supply has been reduced by 30 percent since 2008. A good example is aforementioned desalination plant which is equipped with 210 kWp photovoltaic panels that deliver 17.5 percent of the required energy for this plant. Energy use reduction is an important aspect of drinking water supply in Tunisia as in future more desalination plants will be needed and water needs to be transported over longer distances.
- *Nexus in the transboundary context; examples of GWP-Med work.* The presentation outlines the Nexus Programme at GWP-Med and gives two examples: the Drin Case, and the North Western Sahara Aquifer System. The basin of the Drin River is shared by five riparian countries; there are many interaction, the most important of them the nexus between water, energy and forest ecosystems. The

North Western Sahara Aquifer System stretches over three countries. The benefits of a nexus approach will be the sustainable management of groundwater resources while increasing agricultural productivity and reducing desertification. Benefits also includes energy savings by applying modern pumping technology. The specific case studies shed light on the benefits and value of applying the nexus approach in transboundary contexts

- *Irrigators Communities. A Spanish model for an efficient nexus collective administration.* The presentation describes the participatory approach in the river basin context in Spain, which allows for stakeholder involvement covering many aspects of the nexus approach (Water managers, agriculture, industry, water users, environment, energy...). Giving responsibility for water and energy management to the final users could be a tool to increase efficiency and stimulate savings as any improvement of the water-energy-food systems reverts directly in the operators.
- *The Water-Energy Nexus “WEN”: Investing in a secure Future.* The WEN project is implemented by the NGO Ecopeace Middle East. The project has investigated the potential for mutually beneficial exchanges of water and energy between Jordan, Palestine and Israel within the wider region. It concludes that the WEN is likely to be technically and economically feasible, in addition to achieving geo-political and environmental benefits. Additionally, in-depth studies, inter-governmental coordination and stakeholder’s participation need be further developed to achieve the project’s objectives.

In the subsequent discussion among Mediterranean Water experts, it was concluded by the Working Group that the nexus approach is particularly relevant in the case of the Mediterranean, where the regional characteristics render the implementation of an integrated approach somewhat challenging: water scarcity, natural and financial resources unevenly distributed across space and time, uncontrolled population growth coupled with rapid urbanisation trends, migratory movements often taking place under dramatic conditions, observed impacts of climate change, fast-changing consumption patterns, etc.

A number of recommendations were made that can be found in the Annex to this report. The recommendations led to a number of key messages that are presented in Chapter 4.

4.3.4. URBAN: Reuse in the Mediterranean and its impacts on territories

Despite important improvements, access to safe water and sanitation are still boiling issues in Southern and Eastern Mediterranean Countries (without Turkey), especially considering their structural water stress situation, growing anthropogenic pressures and anticipated climate change impacts. This Region hosts 3.2 percent of the World’s population, only 0.46 percent of the world’s renewable fresh water resources, but hosts almost 50 percent of the world’s population living below the water poverty line³⁴. The demographic

³⁴ Food and Agriculture Organization, AQUASTAT data

and urban growth of this sub-region should increase the pressure on water resources: its population could reach almost 300 million in 2030 while it currently amounts to almost 250 million. Two-thirds of the Mediterranean people live in cities and more than three-quarters of them are expected to live in the cities by 2030. At the moment, most economically exploitable fresh water resources (150 billion of 197 billion m³/year available) are used and alternative solutions (water demand management, desalination, and wastewater reuse) must be found to cover the demand. The expected increase of 2 to 4°C in temperature as well as a decrease of 4-30 percent in pluviometry are expected in the area and will further worsen the situation.

Consequently, with regards to Mediterranean cities, one of the main challenge is to improve the resilience of their current water management & sanitation systems. It offers opportunities to break away from past water management approaches and to shift to innovative water management solutions, such as integrated urban water management, which includes the use of treated wastewater.

The present water use data are not very precise. In the southern and eastern Mediterranean approx. 200 billion cubic meters fresh water are available every year. Total water use is approx. 160 billion m³/year, of which roughly 26 billion m³/year is used for drinking and industry water supply. Taking in account a 60 percent efficiency and a reuse coefficient of 75 percent, roughly 12 billion m³/year could be made available if all wastewater is collected and treated. An improvement of efficiency in both drinking water supply and irrigation from 60 to 80 percent, could make again 32 billion m³/year available. Desalination is already taking place at a large scale in some countries (Spain, Israel, Malta, and Tunisia for example).

In agriculture, wastewater reuse is increasing. In some countries, like for instance Jordan and Israel, it is an important source of irrigation water. In Jordan, Israel, Cyprus and Malta, almost 100 percent of treated wastewater is reused in agriculture, landscaping and industry. In Jordan it makes up around 30 percent of irrigation water sources. In other countries, like for instance Egypt, treated wastewater is either returning to the Nile or discharged to the drainage canals and de facto reused for a considerable part. In for instance Palestine, wastewater reuse is on the top of the political agenda, also for economic reasons (Palestine pays a charge to Israel for releasing wastewater to Israeli territory), but not yet well developed due to lack of wastewater treatment. In Turkey and Egypt, treated wastewater is often reused for landscaping in cities. Again, in Jordan, wastewater in Aqaba is reused as industrial process water as is the case in some northern Mediterranean countries as well. In Spain and Italy wastewater reuse is considerable in terms of quantity, but only a limited percentage of treated wastewater is actually reused. In the Maghreb, wastewater reuse is growing.



Drip irrigation system with treated wastewater. Image: Courtesy of Eng. Sultan Mashakbeh, Water Authority, Jordan

The situation differs largely from country to country, but wastewater is still an underused water source. This is largely due to the public conception that wastewater reuse may be a source for health problems, but also to the discrepancy between existing treatment technology and quality requirements from the potential users. It is interesting to observe that in countries that have severe water shortages (Malta, Jordan, Palestine for instance), public conception about wastewater reuse is now more positive than it used to be some decades ago. It should also be noted that reusing wastewater reduces the charge of pollutants to surface water and as such reuse has a positive impact on water quality and availability of good quality water for among others drinking water supply.

In the urban environment, treated wastewater is used as industrial process water and for landscaping, golf course irrigation, restoration of wetlands, firefighting, and street cleaning among others³⁵. It thus saves precious fresh water resources and contributes to economic development and employment due to savings made. In most cases, industrial areas form part of the urban environment and treated wastewater does not need to be transported over large distances. Reuse for industrial processes and other aforementioned applications may however require special forms of treatment and sound bacteriological quality.

³⁵ A good overview of wastewater reuse is given in: Kellis, M., Kalavrouziotis, I.K., and Gikas, P. 2013. Review of Wastewater Reuse in the Mediterranean Countries. *Global NEST Journal*, Vol 15, No 3, pp 333-350.

In the 3rd Mediterranean Water Forum held in January 2018 in Cairo, a number of interesting case study was presented that highlights the potential and impacts of reuse on the Mediterranean territories:

- *Can Cabanyes as a green Infrastructure for local Economy: the ecological and social Restoration of the Area.* The area of “Can Cabanyes” in Granollers Municipality was a residual part of one of the most important industrial parks in the metropolitan area of Barcelona. In 2002, the Administration invested European funds to start a recovery process in the whole area. The first step was to create a constructed wetland improving the quality of the water coming from the nearby sewage treatment plant. Afterwards, a landscape restoration was carried out which led to the recognition of the area within “Natura 2000”. Moreover, its social use was promoted through policies highlighting the identity of the area; the project proceeded by building an environmental educational center, a birds’ observatory and a pedestrian and cycle path that runs through the area of Can Cabanyes to reconnect the existing forest located at the edge of the industrial park and the Circuit of Catalonia. The success of the project led the municipality to create a partnership with nearby towns to create an environmental corridor in particular for the reuse of treated wastewater for irrigation.
- *Wastewater treatment of Amman and Zarqa municipalities in Jordan.* A first wastewater treatment plant, basically consisting of stabilisation ponds, was built in 1985 near the Zarqa River. However, maintenance was bad, treatment little elaborate and consequently the treatment process did not deliver proper results. Polluting effluents were dumped into the river, leading to a ban on the sale of agricultural commodities produced with the water of the plant. A new plant, larger and more modern, was completed in 2007, as part of a public-private partnership (PPP) with the SUEZ Group and then extended in 2015. The new plant has significantly reduced emissions of polluting effluents and bad smells. The PPP is judged positively in the sense of operation and maintenance, but has at the same time increased prices and make sanitation less accessible for the very poor. The involvement of the population in this project could be improved.
- *Agde Municipality wastewater reuse.* As a Mediterranean resort in the South of the France, this town of 27,000 people hosts close to 300,000 residents each summer and is this faced with severe water stress. A reuse project was therefore established with the support of the French regional Water Agency (Agence de l'Eau Rhône Méditerranée Corse), reducing the discharge of pollutants to the sea and reusing water for the irrigation of green areas of the city, particularly the municipal golf course. The use of treated wastewater allowed water consumption savings close to 10 percent. The city now plans to heat municipal buildings with the energy produced by the wastewater treatment plant.
- *The experience of the cooperation between the municipality of Agde and the municipality of Tata in the region of Souss-Massa, Morocco, on water management.* The city allowed the installation of tertiary treatment so that its treated wastewater can be reused. The goal is to create a green belt around the city while

at the same time realizing substantial savings of fresh water in agriculture, and reduce long-term pollution to make the region more attractive for the tourism.

In the subsequent discussion among Mediterranean Water experts, it was concluded that public authorities and economic operators should unite their skills and their prerogatives to move from a sometimes informal reuse towards a better planned development, accompanying local policies and strategies of greater magnitude, as is the case for instance in Jordan. In the Mediterranean region, the reuse of treated wastewater is essentially focussed on agricultural irrigation, while the municipal and industrial uses are not well developed. Despite the defiance displayed by advocates of water quality water perfect for the health of the public, the solution might be to adopt a pragmatic approach to provide treated wastewater for its future use, as is embraced for example by the United States (Los Angeles)³⁶.

A number of recommendations were made that can be found in the Annex to this report. The recommendations led to a number of key messages that are presented in Chapter 4.

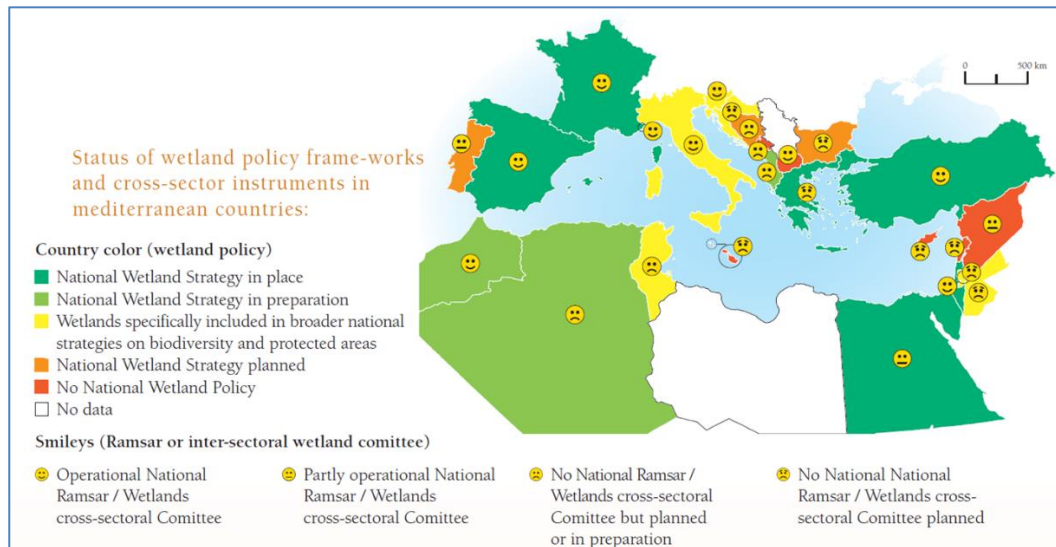
4.3.5. ECOSYSTEMS: Managing and restoring for water services and biodiversity

Most wetlands in the Mediterranean basin are at low altitudes and are predominantly coastal. A number of large river deltas are well known in the Mediterranean. They include the Camargue at the mouth of the Rhone in France, the Po delta in Italy, the Ebro delta in Spain, the combined delta of the rivers Axios-Aliakmon-Loudias near Thessaloniki, the Nestos delta in Northwest Greece, the Evros delta on the border between Greece and Turkey, the Menderes delta in Western Turkey, the Medjerda delta in Tunisia and, of course, the vast Nile delta in Egypt.

These ecosystems provide a wide range of services (fresh water, food, recreational, flood protection, biodiversity) but are in great danger due to human activities as well as climate change.

The Mediterranean hosted, by year 2000, ca. 15 – 22 million ha of wetlands, 1.5 percent of the World's wetlands. In the 20th century, the wetland area dropped however by 50 percent, in particular in the northern part of the Mediterranean, but also in Israel, Turkey, Morocco and Tunisia. The most important reasons for this are the expansion of urban settlements and agriculture, but also the reduction of river discharge in the area with almost 45 percent. A slowdown of this process can be observed since the 1990s. Moreover, artificial wetlands are increasing.

³⁶ Sanitation districts of Los Angeles County. <http://www.lacsd.org/waterreuse/sitemap.asp>



Overview of wetland policies and strategies in place in the Mediterranean countries. Image: courtesy of SEM-IDE

Some responses to wetland loss are being given. An increasing number of wetlands are included as Ramsar Convention sites. Their surface area increased a factor three between 2000 (168 sites) & 2011 (344 sites). Governments are increasingly concerned about wetland loss and degradation, reason why in a number of countries National Wetland Strategies and & National Wetland Committees have been promoted and put in place.

As there is a need for information for feeding public policies & decision-making processes, in 2008, the Mediterranean Wetlands Observatory was put in place, covering 27 Mediterranean countries. It bases on international multilateral agreements, such as the Ramsar Convention, the AEWA Biodiversity Convention, and the UN Sustainable Development Goals, and forms a broad partnership of national authorities, scientific institutions, NGOs, and others. Its ultimate goal is to influence decision makers towards better protection and management of Mediterranean wetlands. The Observatory has two operational objectives, (i) to analyse the status and trends of Mediterranean wetlands, including their biodiversity, the goods and services that they deliver and the environmental factors, pressures and responses that explain their status and trends, and (ii) to promote effective decision-making for the protection, restoration, wise use of Mediterranean wetlands in the framework of sustainable development.

In the 3rd Mediterranean Water Forum held in January 2018 in Cairo, a number of interesting case studies have been presented that highlight the issues at stake for wetlands and restoration of ecosystems in the Mediterranean territories:

- *Lake Manzala Engineered Wetland, a successful model for the Mediterranean Sea protection, highlighting the use of wetlands for treating drainage water and improving its quality before being released to the Mediterranean Sea. The project*

has helped Egypt in an ambitious and pioneering effort to clean and reuse agricultural drainage waters for productive purposes by developing an innovative approach and technology. The success of the applied technology in reducing water pollution has led national authorities to explore the reuse of treated water via engineered wetlands in irrigation, fish farming, and decentralized wastewater treatment technology in remote areas.

- *Albufera³⁷ de Valencia, a semi-urban wetland under ecological recovering process.* The presentation describes the history of the lagoon and the very complex stakeholder environment. The lagoon lacks fresh water and plans are underway to use treated wastewater to restore part of the ecosystem functions. A master Plan has been prepared and is under implementation. First results show large improvements of water quality, a very considerable decrease of phosphorus and chlorophyll; macrophytes have spontaneously recovered and bird species have returned to the lagoon for breeding.
- *Water Ecosystem Services, and restoration techniques.* The presentation explains water ecosystem services and extensively describes wetland restoration techniques and concludes that wetlands provide numerous ecosystem services which economic value is usually an order of magnitude larger than the restoration costs. A number of restoration techniques are available but proper diagnosis must be made before applying them. Ecosystems are key in providing water for mankind.
- *Caractérisation de la problématique des eaux écologiques : orientations stratégiques et plans d'action pour des sites pilotes en Tunisie.* The presentation gives an overview of wetlands in Tunisia, how they are protected, the challenges they face, and what should be done to improve their status. Two pilot sites are presented for which action plans have been developed.

In the subsequent discussion among Mediterranean Water experts, it was concluded that wetlands provide valuable ecosystem services for both local and global communities; for example for climate change mitigation. To achieve public involvement, ecosystem services need to cover the needs of local communities. Research and education are needed to enhance the knowledge on ecosystem services and there is a need to further promote the economic assessment of ecosystem services. The cost of degradation needs to be included into general accounting for projects. With regards to water sharing, the participatory allocation of available resources between different users/sectors and ecosystems can enhance the delivery of ecosystem services.

A number of recommendations were made that can be found in the Annex to this report. The recommendations led to a number of key messages that are presented in Chapter 4.

4.3.6. FINANCE - Finance for Sustainable Development in the Mediterranean

Sufficient and sustainable financing ensures the sustainability of public water services,

³⁷ Albufera means “lagoon” in Catalan

which itself is necessary for human and economic development, social stability, protection of environment and peace. Insufficient funding leads to (i) the deterioration and eventual collapse of water infrastructure resulting in large populations without access to the water services of the appropriate quality, as well as (ii) the inadequate management and protection of water resources.

Water infrastructure is key to delivering long-term water security, and careful consideration should be given to its design and impacts in the context of a changing climate. In this sense, multi-purpose water infrastructure (MPI) is an increasingly important asset. However it does present specific financing problems as the sums involved are typically large, some components are not financially profitable under strict market conditions, many different stakeholders are affected, there are a number of competing users, and conflicts over priorities often arise between them.

In the Mediterranean Region, as anywhere else, there are three main sources of revenues: a) finance that must not be repaid (tax-based public spending), b) tariffs from users, and c) transfers from other sources, including Official Development Assistance (ODA). Any additional sources of finance, such as concessional or market-based loans, micro-finance or private sector investment can be developed through a combination of the three sources of revenues mentioned above. Furthermore, there are new non-traditional financial sources that have become available for infrastructure, such as construction companies, institutional investors, pension funds, insurance companies, water funds and international development banks, as well as traditional sources with an ample scope for increasing their financial commitments and seeking to reduce the time from project conception to project closure.

Today, in a number of Mediterranean countries the water sector and related institutions are seriously underfinanced. Current trends indicate that tariffs for water services and state subsidies are mainly used for operation and maintenance costs of the infrastructures related to water supply and sanitation, whereas ODA transfers are mainly used for the creation of new infrastructures. Policy responses for financing will only be viable if projects are coherent, if roles and responsibilities are clearly allocated, if stakeholders are properly engaged, if well-designed regulatory frameworks are in place, and if long term legal security is guaranteed. Such an “enabling” environment could be built on best practice regimes such as the OECD Principles of Water Governance under the framework of UN Sustainable Development Goals (SDGs).

<p>Four principles provide a framework to help governments ensure adequate financing is available to effectively manage water resources:</p> <ul style="list-style-type: none"> ▶ The Polluter Pays principle creates conditions to make pollution a costly activity, to alleviate pollution, and compensate for welfare loss. In a water security context, the point is that those liabilities should cover the costs. ▶ The Beneficiary Pays principle allows for sharing the financial burden of water resources management across public and private actors. ▶ Equity is often invoked to address affordability 	<p>or competitiveness issues, when water bills are disproportionate with users' capacity to pay.</p> <ul style="list-style-type: none"> ▶ Coherence between policies that affect water resources is essential to ensure that policies are mutually supportive and do not work against each other. <p>Economic instruments such as abstraction and pollution charges or water pricing have a pivotal role to play in financing water resources management. Available evidence highlights that they are most effective when due attention is paid to their design, the way they interact with other instruments, and the institutional and governance structures within which they operate.</p>
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The OECD Framework for financing water resources management³⁸

Optimising water financing in Mediterranean countries is of paramount importance to achieve water and sanitation policy objectives, and to achieve the associated socio-economic and environmental benefits. There is a need to (i) develop financing strategies to improve the overall financing of the water sector through sustainable cost recovery policies, transparent financing mechanisms and realistic targets; (ii) improve efficiencies to reduce the financing gap by reducing investment needs and operational costs; (iii) mobilise additional revenues from tariffs for water services adapted to the socio-economic reality of each territory, public budgets, and ODA grants, as well as from repayable finance, such as external finance and improving the use of existing financial sources; and (iv) encourage private investments in the water sector by promoting public-private partnerships.

The range of existing approaches and instruments is wide and should be assessed in-depth for the different countries and sub-sectors to achieve the appropriate mix of complementary solutions that are adequately tailored to national and sector circumstances. The different instruments that can help achieving the former objectives include:

- Strategic Financial Planning (SFP): the definition of an investment and financing strategy that reduce the financing gap and mobilise additional revenues and financing is required. This process needs to be coordinated across different levels of government, and include appropriate consultation of civil society.
- Coordination to improve the accessibility to bilateral and multilateral finance, including (i) increased coordination and synergies between financial instruments in

³⁸ Source: OECD (2012). A Framework for Financing Water Resources Management.

the Mediterranean Region by increasing awareness of available instruments and ensuring that the accession procedures are clear and increasingly consistent; (ii) coordination of different financing institutions; (iii) targeting the use subsidies to under-financed subsectors and to removing constraints to additional financing; and (iv) technical assistance to prepare projects or to strengthen the implementation and operational capacities of water sector entities.

- Innovative financing mechanisms. This includes exploiting synergies with climate change financing mechanisms and nexus processes.
- Ensure repayable mechanisms when mobilising external transfers (ODA grants and ODA concessional loans, loans and private sector investment).

Economic analysis is needed as well as the use of integrated environmental and economic accounting, as recommended by the UN, in national account systems to measure the contribution of water to the economy and economy impacts on water (uses, services and environmental degradation).

Actions that should be explored include:

- The development of socio-economic models for water allocation between agriculture, industry and domestic uses, taking into account environmental, social aspects and economic development needs. Integrate environmental and water accounts into national accounting systems.
- The quantification and communication of the socio-economic and environmental benefits of investments in the water sector as an essential requisite for national economic growth.
- Raising awareness on existing and emerging funding and financing mechanisms and build capacity to benefit from them. As well as promote training and education on the subject.
- Promoting more and better financing of “non-infrastructure” projects always indispensable before facing the great investments needed for structural actions.
- Establishing and properly prioritising the projects included in action plans, separating and clearly identifying those meeting non-infrastructure needs and those based purely on infrastructure.
- Developing sustainable cost recovery strategies by combining the three sources of revenue: public funds, tariffs and transfers.
- Supporting water efficiency measures for irrigation such as incentives for water saving techniques, gradual introduction of tariff structures and development of self-sustainable irrigators associations.
- Supporting measures protecting water resources and enhancing related ecosystem functions.
- Improving coordination and synergies between bilateral and multilateral financial instruments in the Region. Increasing awareness and ensure clear and consistent procedures.

- Following international competitive and transparent bidding procedures, and foster independent supervision of construction and implementation. Develop and publicise data on best practices in order to improve competition and reduce inefficiencies.
- Improving donor coordination at regional and country level to avoid duplication of funded projects, prioritise actual needs and reduce transaction costs and lead times by supporting, among others multi-stakeholder consultation processes.
- Exploring and promoting innovative financial mechanisms such as blending grants and repayable finance, long-term loans, microfinance, output based aid, grouped financed vehicles, direct lending to sub-sovereign entities, public private partnerships (PPPs).

In the 3rd Mediterranean Water Forum held in January 2018 in Cairo, a number of interesting case studies have been presented that highlight the financing issues in the Mediterranean area:

- *Private contribution on water services in the Mediterranean. Two cases: Spain and Algeria.* The presentation discusses the delegated management of water services in Oran and the Joint Venture (mixed economy) in the South of Spain. In Oran, the intervention aimed at improving services (all customers under 24 hour supply and reduction of breakdown of the sewerage system. Between 2008 and 2014 these targets were indeed achieved. In the South of Spain, the aim was to join public and private assets with the purpose to achieve better financial conditions and economy of scale. The results can only be judged in long-term.
- *Funding the Water Sector; the Spanish Agency for International Development Cooperation (AECID).* The presentation explains the funding strategy and implementation of AECID, particularly after the successful experience in other territories (Latin America) which has prompted the preparation of a specific water cooperation programme for the southern and eastern Mediterranean
- *Finance for sustainable development; Finance of WUAs in Mediterranean; Egypt-Case study.* The presentation explains the role of Water User Associations in Egypt. These are established by law but have no legal background that enables them to finance their operations. The presentation discusses a number of options how WUAs can be financed, which refer not only to the Egyptian scope, but to the whole region, according to data and information provided by the EIC Euro-Mediterranean Irrigators Community, where Egypt is a very active member.
- *A New Funding Mechanism for Mediterranean MPAs.* The presentation described the funding mechanisms of Mediterranean Marine Protected Areas. Following a strategic study in this area, an Environmental Fund/ Trust Fund was identified as the most suitable approach. Many governments and regional organisations contribute to this trust fund. Fundraising efforts and outreach activities are ongoing and first operations on the ground have started to give positive, and tangible signs that there is a will and capacity to take prompt actions; a second round of investment will be launched in 2018.

- *Les grands projets de la SONEDE pour la sécurisation et le renforcement de l'alimentation en eau potable* (Tunisia). The presentation describes the water supply agency SONEDE. Confronted with water stress and growing demand, SONEDE has established programs of strengthening and securing drinking water supply until the year 2030, including strengthening of the drinking water supply in rural areas, the construction for the transfer of water from the North to the Sahel and Sfax regions, the construction of two dams for storage and regulation (strategic reserve), sea and brackish water desalination, improvement of the performance of distribution networks. The presentation gives a comprehensive overview of the realised and planned projects.

In the subsequent discussion among Mediterranean Water experts, the Working Group concluded among others that sufficient and sustainable financing of public water services is crucial for human development and environmental protection in the Mediterranean region where there is a lack of data regarding financial flows. Awareness of the international financing instruments and mechanisms should be improved, sustainable cost recovery strategies should be developed and private investments in the water sector should be promoted. Projects should in the planning phase include climate change strategies and the nexus approach water-energy. Investments in management are necessary as well. Financing of “water governance” is considered a key-issue. Moreover, a wide array of stakeholders should be involved in all phase of project preparation and implementation.

A number of recommendations were made that can be found in the Annex to this report. The recommendations led to a number of key messages that are presented in Chapter 4.

5. Final Remarks

5.1. Regional issues synthesis

The Mediterranean Region is foremost a region connected to the Mediterranean Sea. Its economy (tourism, maritime transport, and industry), population centres, history and culture are closely connected to the Sea.

The Region, in particular its southern and eastern part, may export olive oil but imports most of its food. The Region so far also is a net importer of energy, even though this differs considerably from country to country. Its potential for alternative energy, solar and wind is high, but largely still unexploited.

The Region's exploitable fresh water resources are, except in the Western Balkans countries, relatively scarce and below world average figures. The Southern and Eastern Mediterranean countries represent one of the most water scarce regions in the world, after the Arabian Peninsula. In this part of the Mediterranean Region, almost 35 percent of the water resources are "imported" from outside (Nile, Euphrat), giving an extra political dimension to water resources availability. Increasingly, countries use, as a last resort, water from the Mediterranean Sea to generate drinking water (and water for industrial and even agricultural purposes) through desalination, which is forcibly expected to take a large growth in near future. The hardly restrained growth of its population³⁹ aggravates the water problem from year to year and solutions become more complex, politically demanding and costly.

With a population of over 250 million people living in the area that drains to the Mediterranean Sea, the impact of these inhabitants and their economic activities on their Sea in terms of biodiversity, ecosystems and pollution is intense. This is aggravated by the fact that still a considerable part of the Mediterranean population has no access to improved sanitation and subsequent wastewater treatment.

Climate change will have a huge impact on temperature and rainfall in the Mediterranean area. In the southern and eastern Mediterranean, the predictions of the IPCC go into the direction of 20-30 percent less rainfall, next to increasing temperatures and a more extreme climatic events such as heat waves and flooding. Seen the already scarce water resources in the Region this is of utmost concern and becoming an issue of survival. Sea level rise is also an important issue for the coastal areas and in particular for the Egyptian Nile delta.

³⁹ the average population growth in the area is around 1.5 percent per year, mainly due to high birth rates in particular in the south and east and internal migration and immigration in the north

Water energy and food are increasingly scarce natural resources in the Mediterranean environment. Increased scarcity make them more dependent on each other and their management would profit from an integrated nexus approach. The nexus approach will facilitate enhancement of water, energy and food security, while preserving ecosystems and their functions, by increasing efficiency and productivity of resources, reducing trade-offs, shifting towards more sustainable consumption patterns and improving demand management, buildingsynergies and improving governance across sectors, through policy mainstreaming and cross-fertilization and enhance IWRM application, assisting in the water sector policies and strategies to harmonize with these of water-using sectors. It should be noted however that solutions need to be tailor-made and localized: one-size does not fit all.

Access to improved sanitation has improved considerably over the last 20-30 years. Even in the southern and eastern part of the Mediterranean Region it exceeds with over 90 percent worldwide averages by far. However, government policies aim at achieving full access by the year 2030. Technology is available, but financing – also of operation and maintenance - and institutional organisation are not always in line with aspired targets.

Wastewater reuse differs from country to country. In countries like Malta, Israel and Jordan, almost all wastewater is reused. In other countries which are still more water rich, wastewater reuse still has a large development potential. Taking into account that for instance in the southern and eastern Mediterranean countries, almost 20 percent of all fresh water resources is used for drinking and industrial water use, a considerable part of this 20 percent can be reused and as such represents a large source of water for a number of applications, above all in agriculture and in the urban environment. Practice in very water poor countries show that hesitance to reuse can be overcome.

Wetland ecosystems can play an important role in integrated water management. They provide important ecosystem services which increase biodiversity and protect sensitive water resources in both quantitative and qualitative sense. Ecosystem development should therefore be a component of water management services. Water-related SDGs will be achieved while protecting and enhancing wetland ecosystems and the services they provide, or otherwise they will not be achieved at all.

Sufficient and sustainable financing ensures the sustainability of public water services, which itself is necessary for human and economic development, social stability, protection of environment and peace. Insufficient funding leads to the deterioration and eventual collapse of water infrastructure resulting in large populations without access to the water services of the appropriate quality, as well as the inadequate management and protection of water resources. Financing and strategic planning should be fine-tuned to each other and coordination between International Financing Institutions (IFIs) and governments should be enhanced.

5.2. Interregional relations carried out

The Mediterranean region and the region of the Arab countries share a large number of issues and challenges related to the cause of water, be it geo-climatic, geo-environmental, or geo-social-economic. Sharing knowledge on water and cooperation in exchanging experiences and know-how is essential. Mobilizing for their participation in the 8th World Forum, the two regions organized regional forums where these principles of sharing and cooperation have been highlighted. Because of their geographic location these two regions are placed at the crossroads of three continents and are predestined to be at the center of the problems posed by emergencies related to climate change, security of water supply resources and the exploitation of shared waters.

5.3. Key messages

Policy level

- ▶ There is a need to join forces and create a conducive environment to enhance regional cooperation towards sustainable and integrated water management in the Med region “by creation a sustainable mechanism that enables cooperation among regional actors and with other regions toward holistic global vision supporting the following line of actions:
 - Access to safe drinking water and sanitation is a fundamental human right.
 - Water requires policies and regulations to ensure availability, quality and sustainable management (sound governance).
 - To highlight the role of water in the “the sustainable socio-economic development and environmental protection in the Mediterranean”. In this line, among other issues it also highlighted its potential contribution in tackling migration challenges.
 - The impact of climate change on water resources in the Mediterranean region.
 - The need to mobilize appropriate and sustainable investments and financing.
- ▶ A regional policy framework will give a more concrete sense to the global policy agendas, ensuring that it remains rooted in regional priorities, such as those defined by the UfM or the MSSD linked to the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs).
- ▶ There is consensus in the water sector in the Mediterranean region of its particular vulnerability to climate change and consequently on the extreme relevance for the region of the Paris Agreement - particularly relevant as efforts are currently being made to increase the visibility of water - and of funding for the sector within this global agenda. The water sector can also benefit from further development of the circular economy, SCP approaches and of green growth which can lead to more efficient water usage and enable sustainable creation of jobs.
- ▶ Multiple partners and organisations work in the region and provide much needed

technical, as well as financial support to the water sector, yet there remains a strong demand for enhanced capacity building training to improve national and local governance capabilities, to adapt and face consequences of climate change and be able to harness the potential of new technologies.

- ▶ Coordinated contributions by thematic partners, regional institutions, stakeholder organisations, and the donor community are highly encouraged and invited as the regional cooperation adds distinctive value and complements the national efforts, by, whenever appropriate, facilitating and supporting experience sharing; promotion of common approaches after adaptation to local needs; joint pilot projects; valorisation of existing, including traditional, knowledge; innovative practices including through knowledge and technology transfer; and enhances the investment opportunities and access to sustainable financing.

Climate Change

- ▶ The Water Sector is one of the most vulnerable sectors to possible climate change and human induced impacts. The Mediterranean Region and more specifically North Africa and the Middle East is one of the most vulnerable regions in the world to these impacts. With parts of that region being amongst the driest regions in the world, it makes the water sector the most challenging sector to deal with under climate change scenarios. Considering a climate reduced water scenario when dealing with an already water-scarce sub-region or country, under an ever increasing water demand, it becomes inevitable that the region needs to work harder on adaptation mechanisms.
- ▶ The impacts of climate change on sea level rise and especially on low coastal zones on the Mediterranean Sea are becoming issues of great discussion, especially with the potential impact on fresh groundwater. Some of the existing natural features such as sand dunes, and physical structures such as the ones currently installed on the Nile Delta in Egypt for shore erosion protection could serve as a protection against sea level rise impacts. However further studies are needed to investigate potential areas at risk, if sea level rise is to be realized near the Nile delta or other Mediterranean coastal low lands.
- ▶ Adaptation mechanisms to the impacts of climate change and the uncertainties associated with the future predictions require further research to avoid compounded environmental impacts. It also needs robust and integrated water resources management, integrated coastal zone management and proper land use planning. Inherently, this includes environmental impact assessment of proposed mechanisms, socio-economic analysis of proposed solutions, resources demand management, public awareness and behavioural change.
- ▶ A good part of the fresh water available in the Mediterranean Region, in particular in the Nile and Euphrat basins, comes from outside the Region. To implement effective climate change transboundary water adaptation programs, one needs to study the physical, geographical, hydrological, and anthropogenic settings of transboundary river basins. Geopolitical constraints may hamper climate change

adaptation substantially and need to be removed.

- ▶ Countries in the Mediterranean should intensively cooperate on downscaling Global Climate Models to a Regional Climate Model, with the objective to get better climate change predictions and adapt regional and national adaptation strategies and actions plans. At the same time a regional map for climate change indicators and vulnerability should be prepared and a Mediterranean network of meteorological stations should be established to improve knowledge sharing.
- ▶ Solar Energy transfer from South to North Mediterranean

Sanitation for all

- ▶ The majority of Mediterranean countries have made sustained efforts to improve the sanitary conditions of urban agglomerations and to protect the environment through major projects in the field of sanitation; many of these countries have developed national strategies and programs to improve and set up sanitation infrastructures since the 80s of last century.
- ▶ The dramatic growth in sanitation in many Mediterranean countries requires the implementation of considerable efforts to prevent environmental problems that the coming generations will have to solve.
- ▶ These efforts and strategies are implemented in line with SDG 6 "Ensure access to water and sanitation for all" and are currently directed towards general access to sanitation services, including rural areas, by sharing best and adapted practices from prior experiences. This includes the improvement of treated wastewater reuse as a nonconventional resource that can contribute to mitigating local water shortage.
- ▶ Knowledge acquired by European Southern countries must be shared constructively, if possible at the government level, by public companies, or by the private sector; SDG 17: "Revitalize the global partnership for sustainable development".
- ▶ More efforts should be made concerning sludge management, mainly through the implementation of sludge strategies for the management, treatment and final destination as a national issue, rather than a local challenge. Sludge should be considered as a valuable product in a circular economy context, to the detriment of landfill solutions.
- ▶ Legislations adapted to local reality should be implemented for reuse and sludge valorisation in order to allow circular economy and sustainable development. At the same time, awareness on the reuse of treated wastewater and the use of sludge should be improved to assure social acceptance of the final products.

The Water-Energy-Food Nexus

- ▶ Benefits from the nexus application are multiple: from security of sectors to social-economic and environmental, including job creation. However, it is important to make explicit these benefits for a wider acceptance of the nexus approach by means of developing a monitoring framework to evaluate the level of success

when implementing nexus applications and by the application of ex-post analysis of specific examples to strengthen the case of the nexus at different levels and scales.

- ▶ Provide targeted support, including structural aspects, for institutions to tackle the difficulties of handling complexity relating to nexus application. This includes paying attention to the allocation of responsibilities of Ministries and how they affect the nexus application.
- ▶ When applying nexus approaches, there is a need to include different stakeholders from all levels, ensuring their active involvement through appropriate legal and regulatory frameworks.
- ▶ Technology needs to be adequately integrated in all activities to accelerate the meeting of sustainable development objectives.
- ▶ Water professionals need to think beyond the water box and consider options for integrating and synergizing energy and food production aspects as well.

Wastewater Reuse

- ▶ The link between cities and territories should be reflected upon and projects should be implemented that are adapted to the uses, needs and the local context. A reuse project raises the question of the relevant space in which it fits. When considering reuse, it may, for a periurban area, be more efficient to use decentralized wastewater treatment with natural purification processes, less expensive in construction and maintenance, than necessarily using a "central WWTP" treating the effluents of an entire region. It is therefore essential that all stakeholders (public authorities, the private sector, users, etc.) can work together to design and implement an integrated reuse project. The use of public-private partnerships could be considered, but may not be absolutely required for the success of a reuse project.
- ▶ Beyond reuse: adopting a circular economy strategy. Wastewater recycling helps to create a virtuous economic and ecological cycle; its impacts are multiple and can only be apprehended within the framework of a "nexus" approach. Reuse favours the economic activity by the savings realized by substituting the fresh water by treated wastewater adapted to a specific use (agricultural irrigation, ecological restoration, watering of green spaces, industrial use, etc.). It reduces the human footprint on the environment, contributes to adaptation to global warming, etc. This systemic approach requires consideration of the entire water cycle.
- ▶ North-South, but also South-South cooperation in the Mediterranean should be strengthened and structured. We must continue to value the know-how of some countries in the region, but also learn from the failures. It would be interesting to further structure the cooperation, notably through the launch of a specific Euro-Mediterranean call for projects to target innovative projects (on the use of sewage sludge, for example), of a scientific and/or normative nature (adaptation, generalization or harmonization of standards in force between countries). Emphasis should be placed on strengthening the capacity of local authorities, particularly

for the implementation of IWRM, but also on the education of users through a triptych "awareness - explanation - demonstration" to develop the use of treated wastewater. This last point is also essential, as reuse, by increasing the availability of water resources for a given use, must not lead to the wasting of these resources.

Ecosystem Services

- ▶ Wetland ecosystems can play an important role in integrated water management. They provide important ecosystem services which increase biodiversity and protect sensitive water resources in both quantitative and qualitative sense. Ecosystem development should therefore be a component of water management services.
- ▶ Ecosystems know no boundaries; they require cooperation and solidarity. The particular nature of water ecosystems and its linkage with the water cycle makes them a very relevant example of how the effects of actions of any sign taken at any place can be found across borders and both at local, regional and even continental scales.
- ▶ Integrate ecosystem deterioration into pricing of water services. In accordance with the "polluter pays" principle, the cost of deterioration of water ecosystems and its services should be integrated into the pricing policies for every water use sector, in order to collect funding for restoration projects and to discourage unsustainable use policies.
- ▶ Ecosystems are of great value for the fight against climate change. The ecosystem services of climate regulation, flood protection and carbon sequestration are only a few of the examples that illustrate how healthy water ecosystems can be a cornerstone in the fight against climate change.
- ▶ Maintaining essential productions requires maintaining ecosystem services. Multiple links have been found between sectors that sustain society in a strict survival sense, such as food production or water supply, and ecosystem services provided by wetlands. Maintaining these ecosystems in good working order is essential to ensure the sustainability of our very means of subsistence.
- ▶ There will be no achieving the SDGs if we turn our back on the water ecosystems. Water-related SDGs will be achieved while protecting and enhancing wetland ecosystems and the services they provide, or otherwise they will not be achieved at all.

Financing

- ▶ Sufficient and sustainable financing of public water services is crucial for human development and environmental protection in the Mediterranean region where there is a lack of data regarding financial flows. Countries should develop sustainable cost recovery strategies before embarking on larger investments.

- ▶ In the planning phase, before making investments, impacts of climate change, climate change strategies have to be assessed, water-energy nexus approaches should be reflected and in general a holistic approach on water management, including resource management, water service delivery and non-conventional water resources should be implemented.
- ▶ There is a need to find adequate funding mechanisms. Awareness of the international financing instruments and mechanisms is not always available; it is necessary to establish a regional map of financing institutions.
- ▶ In order to achieve “planning independency”, meaning that relevant ministries and agencies will be able to prepare the necessary documentation to make projects bankable and supervise all aspects of project implementation, investments in management are necessary as well. Financing of “water governance” is considered a key-issue.
- ▶ Civil society engagement in water management is essential. A wide array of stakeholders should be involved in all phases of project preparation and implementation. This should involve governmental agencies, municipalities, water service providers, the private sector, the population at large and NGOs. Transparency and open dialogues produce strong benefits.
- ▶ Public funds are limited and subject to many priorities. Private investments in the water sector should be encouraged by promoting public-private partnership and strengthening regulation of the sector. Necessary legislation should be adopted where this is a deterrent to private investment.

6. Annexes

6.1. Annex 1. Acronyms and abbreviations

AECID	Spanish Agency for International Development Cooperation
AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
AFD	Agence Française de Développement
CEDARE	Centre for Environment and Development for the Arab Region and Europe
CIA Factbook	Central Intelligence Agency Factbook
CSO	Civil Society Organisation
EIC	Euro-Mediterranean Irrigators Community
EMEG	Euro-Mediterranean Expert Group on Water, Food and Energy
EU	European Union
GRID-Arendal	Norwegian foundation closely working with UNEP
GWP	Intergovernmental organisation Global Water Partnership
GWP-Med	Mediterranean Regional Water Partnership of the Global Water Partnership (GWP-Mediterranean)
GWSP	Global Water System Project
IEMed	European Institute of the Mediterranean
IME	Institut Méditerranéen de l'Eau
IPCC	Intergovernmental Panel for Climate Change
IPEMED	Institute de Prospective Economique du Monde Méditerranéen
IWRM	Integrated Water Resources Management
MAP	Mediterranean Action Plan
MDG	Millennium Development Goal
MEDCITIES	Mediterranean Cities Network
MENBO	Mediterranean Network of Basin Organisation
MPA	Marine Protected Area
MSSD	Mediterranean Strategy for Sustainable Development
NGO	Non-Government Organisation
NWRC	National Water Research Centre (Egypt)
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OIEau	Office International de l'Eau
ONAS	Office Nationale de l'Assainissement (Tunisia)
ONEE	L'Office National de l'Electricité et de l'Eau Potable (Morocco)
PPC	Political Process Commission
RDG	Regional Design Group
SCP	Structure Conduct Performance
SDG	Sustainable Development Goal
SEMIDE	Euro-Mediterranean Water Information System (EMWIS)

SFD	Strategic Financial Planning
SIWI	Stockholm International Water Institute
SONEDE	Société Nationale d'Exploitation et de Distribution des Eaux
TPC	Thematic Process Commission
UfM	Union for the Mediterranean
UfMS	Union for the Mediterranean Secretariat
UN	United Nations
UNEP	United Nations Environment Programme
WEF	World Economic Forum
WEG	Water Expert Group (of the UfM)
WEN	Water-Energy Nexus
WSSCC	Water Supply and Sanitation Collaborative Council
WUA	Water User Association
WWC	World Water Council
WWF	World Water Forum
WWF	World Wide Fund for Nature
WWTP	Wastewater Treatment Plant

6.2. Annex 2. References

References are included in the report text as footnotes to improve readability

6.3. Annex 3. Recommendations made by the Thematic Working Groups during the 3rd Mediterranean Water Forum, 22-24 January 2018 in Cairo

6.3.1. Climate Change

- ▶ National Laws and Legislations should embrace Water related Climate Change Adaptation and Mitigation measures
- ▶ The Water Community need to communicate with the Climate Change Community
- ▶ Water Management authorities and operators at all levels are encourages to monitor their water and energy consumptions, in addition to water losses and leakages, and implement measures for adaptation and mitigation.
- ▶ Tools in the water sector, include leak detection, remote control meters, trenchless civil works, low emission vehicles, less transportation trips, use of renewable energy, feeding in generated renewable energy into national grids...
- ▶ Technology transfer and exchange of modern flood frequency measurement tools are encouraged
- ▶ Given the uncertainty about projections of the impacts of climate change, it is important to implement no-regret actions, and precautionary principles because the cost of inaction may be greater than the costs of adaptation.

- ▶ Awareness and behavioural change is needed, and sometime traditional and indigenous solutions are less expensive than large investment projects
- ▶ Allocating funds and Monitoring progress in adaptation and mitigation activities is important
- ▶ Adaptation measures include Desalination & Wastewater Reuse
- ▶ Cautious Groundwater Recharge with treated wastewater are options but should avoid groundwater pollution potential
- ▶ Water Demand Management and efficient use
- ▶ Storm water harvesting
- ▶ Use of renewable energy in pumping and groundwater abstractions.
- ▶ Rainfall change need to be studied carefully and weather stations should be intensified
- ▶ There is enough knowledge to make use concerned but there is a need to narrow down the uncertainty levels
- ▶ Public Domain datasets of historical weather data are now available and could be retrieved but information about them should be disseminated
- ▶ Comparison of historical data confirms increased temperature
- ▶ Development of a Mediterranean Regional Strategy for CC and Adaptation
- ▶ We should avoid negative adaptation measures where adaptation infrastructures may have other environmental impacts.
- ▶ Combining different levels of adaptation national, regional, basin, and local community level
- ▶ Produce Mediterranean PCC Report
- ▶ Considering CC impacts and adaptation beyond Mediterranean countries borders especially on Transboundary rivers originating out of the region
- ▶ Adaptation plans have to be couple with land use planning
- ▶ The Mediterranean Region could also contribute to CC mitigation measure which will also reduce pollution problems in the Med.
- ▶ Study impact on Groundwater recharge
- ▶ The Region need to start with the climate smart no-regret actions related to CC adaptation and mitigation.
- ▶ Local authorities and basin level Adaptation and mitigation initiatives are important and need to be supported
- ▶ Embrace an integrated optimal water allocation of all types of water (blue water (surface & groundwater), green water, virtual water, recycled water, treated wastewater, desalinated water, etc.)
- ▶ The Region need to facilitate the access of the CC Adaptation Funds

6.3.2. Sanitation for All

- ▶ The majority of Mediterranean countries have made sustained efforts to improve the sanitary conditions of urban agglomerations and to protect the environment through major projects in the field of sanitation

- ▶ Many of these countries have developed national strategies and programs to improve and set up sanitation infrastructures since the 80's of last century.
- ▶ These efforts and strategies are implemented in conformance with SDG 6 "Ensure access to water and sanitation for all" and are currently directed towards the generalization of access to sanitation services including rural areas by sharing best and adapted practices from prior experiences, and by the improvement of treated wastewater reuse as a nonconventional resource that can contribute to mitigating local water shortage.
- ▶ Knowledge acquired by European Southern countries must be shared constructively, if possible at the government level, by public companies, or by the private sector; "SDG 17: Revitalize the global partnership for sustainable development".
- ▶ More efforts should be made concerning sludge management mainly through the implementation of sludge strategies for the management, treatment and final destination as a national issue, rather than a local challenge.
- ▶ Sludge should be considered as a valuable product in a circular economy context, to the detriment of landfill solutions.
- ▶ Legislations adapted to local reality should be implemented for reuse and sludge valorisation to allow circular economy and sustainable development.
- ▶ To insure final results, sensibilisation and raising awareness of people are necessary to assure social acceptance of the final products (water reuse and sludge)
- ▶ The dramatic growth in sanitation in many Mediterranean countries requires the implementation of considerable efforts to prevent environmental problems that the coming generations will have to solve.

6.3.3. The Water-Energy-Food Nexus

- ▶ Provide targeted support, including structural aspects, for institutions to tackle the difficulties of handling complexity relating to the nexus application
- ▶ Pay attention to the allocation of responsibilities of Ministries and how they affect the nexus application (e.g. covering both energy and water)
- ▶ Need to develop monitoring framework to evaluate the level of success when implementing nexus applications
- ▶ Multiple fields of nexus application exist - useful to have an ex-post analysis of specific examples to strengthen the case of the nexus
- ▶ Role and importance of focusing on governance of water
- ▶ Benefits from nexus application multiple: from security of sectors to social-economic and environmental, including job creation
- ▶ Technology can offer options, but cannot confront all challenges of meeting sustainable development objectives
- ▶ Need to include different stakeholders from all levels, ensuring their active involvement through appropriate legal and regulatory frameworks
- ▶ Important to think beyond the water box and consider options for integrating the integrated

6.3.4. Wastewater Reuse

- ▶ All the stakeholders have to work together in the conception and implementation of REUSE projects (« win-win » approach between local authorities, users, private sector, etc., etc.). Public-Private Partnership to facilitate the development of REUSE projects (case study from SUEZ).
- ▶ Territorial & bottom-up approach
- ▶ Move from pilots projects to planned strategies
- ▶ Promotion of nexus approach & nature-based solutions
- ▶ Education & public awareness
- ▶ Generalisation & harmonisation of suitable norms according to the uses of treated waste water (different classes of treated water);
- ▶ Enhance IWRM especially at the urban level through capacity building, share of experiences, etc.
- ▶ Bring our outcomes and recommendations to the other regions and to the political and thematic processes of the 8th World Water Forum and set up a permanent Working Group on this topic after the event.
- ▶ Launch of a call for North – South projects dedicated to innovative projects / subjects (sludges).

6.3.5. Ecosystem Services

- ▶ Wetlands provide valuable ecosystem services for both local and global communities; for example, climate change mitigation
- ▶ To achieve public involvement, translate ecosystem services in terms of the needs of local communities
- ▶ You only learn to love what you get to know: research & educate
- ▶ Need to further promote the economic assessment of ecosystem services
- ▶ Include the cost of degradation into general accounting for projects
- ▶ Water sharing: participatory allocation of available resources between different users/sectors and ecosystems can enhance the delivery of ecosystem services
- ▶ Ecosystems know no boundaries: they require cooperation and solidarity
- ▶ Integrate ecosystem deterioration into pricing of water services
- ▶ Ecosystems are of great value for the fight against climate change
- ▶ Maintaining essential productions requires maintaining ecosystem services
- ▶ There will be no achieving the SDGs if we turn our back on the water ecosystems
- ▶ Regional level assessment for the ecosystem services provided by the main Mediterranean wetlands
- ▶ Raise awareness and research on the relationship between water and biodiversity
- ▶ Regional program for awareness raising on the subject of water related ecosystem services
- ▶ How can we enforce an allocation of water for the ecosystems?
- ▶ Are NBS an alternative to traditional, grey infrastructure solutions?
- ▶ How to assess which restoration measure(s) is best for each scenario?

6.3.6. Financing

- ▶ Sufficient and sustainable financing of public water services is crucial for human development and environmental protection in the Mediterranean region where there is a lack of data regarding financial flows.
- ▶ Impacts of CC have to be evaluated before investments. Beneficiaries of financing must justify these impacts: capacity building necessary.
- ▶ Holistic water management integrating all water resources is primordial in the region. Innovation has to be sought especially in non-conventional water resources.
- ▶ Solutions have to be found looking for consistency between river basin planning and territorial planning.
- ▶ Investments in management are necessary. Financing of “water governance” is considered a key-issue.
- ▶ Raise awareness of the international financing instruments and mechanisms available. As well as promote training and education on the subject.
- ▶ Type of projects to be funded depends on the financing institutions. Importance of the protection of ecosystems.
- ▶ It is necessary to establish a regional map of financing institutions.
- ▶ Develop sustainable cost recovery strategies by combining sources of finance (tariffs, taxes, transfers,...).
- ▶ Need to reinforce the water security in public water supply, with specific projects for rural areas.
- ▶ Encourage private investments in the water sector by promoting public-private partnership and strengthening regulation of the sector.
- ▶ Projects have to be analysed into groups, including wide range of stakeholders.
- ▶ Development user associations is needed for assuring integrated water management. Need of funding some of their activities.
- ▶ It essential the civil society engagement in water management. Need to find adequate funding mechanisms. Transparency and open dialogues produce strong benefits.