ANALYSING TAKING ACTION
ANTICIPATING

WATER GOVERNANCE IN MEDITERRANEAN CITIES
WATER GOVERNANCE IN MEDITERRANEAN CITIES
CONTENTS

Water Think Tank in a few words ........................................ p.04
Analysing ........................................................................ p.07
Taking action .................................................................... p.11
Anticipating ....................................................................... p.15
Key concepts ....................................................................... p.19
Looking ahead ..................................................................... p.21
Partners of the Water Think Tank ...................................... p.22
The Water Think Tank Méditerranée (WTT) initiative was launched by the Prince Albert II of Monaco Foundation during the fifth World Water Forum in Istanbul in March 2009, in partnership with the United Nations Institute for Training and Research (UNITAR), the Plan Bleu, the International Office for Water and Veolia Environnement. This initiative follows on from a round table organised by the Prince Albert II of Monaco Foundation, UNITAR and Veolia Environnement during the Zaragoza Water Expo in 2008, on the theme of integrated water resource management and the role of local authorities.

Urban development lies at the root of many challenges concerning water management throughout the countries bordering the Mediterranean Sea. Each local environment has its own specific constraints, often accentuated by the effects of climate change: water scarcity, deterioration in the quality of natural resources, state of water and sanitation service networks, conflicts of use etc. These complex problems require solid arbitration to ensure the sustainable development of the Mediterranean countries. They also involve the implementation of solidarity mechanisms in various forms and at various levels.

The Water Think Tank Méditerranée fosters dialogue in order to promote sustainable and integrated water resource management in the Mediterranean Basin. In order to carry out this task successfully, the WTT endeavours to take on board the views of all the public and private stakeholders involved in water management, and implements tools for exchange and cooperation through the production, capitalisation and sharing of knowledge.

Several water initiatives exist in the Mediterranean area, bringing into play mechanisms for political, financial, scientific and technical cooperation. The main aim of the Water Think Tank Méditerranée is to identify and promote governance mechanisms that will contribute towards efficient coordination between the various levels of management, especially between catchment basins and local authorities. This involves examining, through concrete case studies, the conditions required to ensure the sustainability of drinking water and sanitation services in Mediterranean cities to ensure equitable water access.

The project is now in its next phase, following on from the first round of research which was presented at a symposium in November 2011 on the theme ‘Territorial governance of water in the Mediterranean: sharing experience and finding solutions for local stakeholders’ and in a first WTT publication looking at conflicts of use and water regulation in Mediterranean cities. This latest WTT document examines the issues in greater depth, focusing on water management and conflicts of use in Istanbul and Rabat, two major historic and culturally important cities.
One thousand days ahead of the deadline for the Millennium Development Goals (MDGs), the 24th Governing Council of the United Nations Human Settlements Programme (UN-Habitat) reminded all stakeholders of the importance of stepping up efforts to honour our commitments to achieving a more sustainable world, in which 52% of the population now live in cities (3.6 billion people) and 12% are slum dwellers (862 million).

Significant progress has already been made and the signs are encouraging: extreme poverty rates have been halved worldwide, two billion more people have access to drinking water, and infant and maternal mortality rates have fallen considerably. Nonetheless, we still face huge challenges, especially in health and sanitation, which are key focus areas of UN-Habitat’s work, in particular through the Global Water Operators’ Partnerships Alliance (GWOPA) and international projects addressing access to water and sanitation.

Against this backdrop, interdisciplinary research initiatives and action programmes undertaken through innovative partnerships between international organisations and stakeholders from civil society and the private sector are essential for fostering dialogue, gaining a more in-depth understanding of the situations encountered in different regions, and accelerating the spread of knowledge.

It is in this context that I would like to praise the long-term action undertaken by the founder members of the Water Think Tank Méditerranée, set up at the instigation of the Prince Albert II of Monaco Foundation at the 5th World Water Forum in Istanbul in association with its partners Veolia Environnement, Plan Bleu, the International Water Office and UNITAR.

The Mediterranean region faces a great many challenges but also some extraordinary opportunities in the area of urban development. Territorial governance of water resources is a key issue for the authorities, especially at local level, and all the more in the context of climate change.

The rapidly developing Mediterranean cities of Rabat and Istanbul make particularly apt illustrations for this publication.

The work of the Water Think Tank Méditerranée will be useful preparation for the third United Nations Conference on Housing and Sustainable Urban Development (Habitat III), where the role of water-related issues in strategic urban planning will be a major topic of discussion.
Cities have a two-way relationship with water. Urban life is organised and structured around precious water resources, severely impacting the river and marine ecosystems on which it depends. In large cities, withdrawing water for domestic, industrial, agricultural and tourist needs and discharging wastewater jeopardise the principle of access to water for all.

Taking this interdependence into account is not a new idea; it has helped to shape a water culture among Mediterranean populations often exposed to harsh climatic conditions. They have learned to manage the water cycle such that their everyday needs are met, even in times of crisis and scarcity. Both Morocco and Turkey have gradually acquired a regulatory framework, techniques, tools and specialist knowledge to distribute their water resources fairly, arbitrate conflicts of use and preserve the natural environment.

Water is a vital element that has always been at the centre of strategic choices. As far back as the Byzantine era, the emperors of Constantinople extensively modified the water supply system inherited from the Romans. They abandoned the costly and vulnerable aqueduct system and built huge cisterns in the city, to make it more independent and resilient.

The availability of water resources exerts intense pressure on the economic and political life of a city, requiring long-term choices to be made and limiting development prospects for sectors that consume large volumes of water. Water stress in Rabat, for example, is causing fear and tension. Any progress made in water management is a particular source of hope.

Rabat and Istanbul, with their rich history and culture, are high-profile capitals which, like the majority of major cities, have to contend with problems related to the quantity and quality of their water resources. While in the western Mediterranean conflict arises out of the notion of growing scarcity due to climate change, at the eastern end it is more a matter of massive urban densification giving rise to increased consumption and putting greater pressure on the available resources. In both cases, pollution remains an aggravating risk factor.

Of course the comparison is useful only up to a certain point, but it is interesting to look, from both the local and universal perspective, at the solutions both cities have implemented to address the question of conflict over the use of water resources.

This second publication gives an overview of the research carried out by the Water Think Tank Méditerranée: analysing the geographic and urban context, both of which are potential sources of tension; taking action on an organisational as well as technical level; and, above all, anticipating the development trajectories of two cities in the process of radical transformation.
Analysing
WATER DEFINES A CITY

“Dependence on the natural environment to some extent shapes a city’s destiny”

OFTEN SCARCE, ALWAYS FRAGILE

The amount of water available, the renewability of the resource and exposure to natural hazards are three factors that profoundly influence urban development and define potential conflicts of use.

The amount of water an area has available is defined by the density of hydrographic resources, which varies significantly from one place to another. Istanbul is surrounded by seven major natural basins (Alibeyköy, Terkos, Sazlidere, Büyükçekmece, Ömerli, Elmalı and Darlık) fed by numerous watercourses, while Rabat is served mainly by two wadis (rivers – the Bouregreg and the Grou with its tributaries Korfila and Akreuch) and groundwater tables that are difficult to exploit. The difference between the amounts of water our two example cities have available is striking.

In addition to available reserves, rainfall and flow rate bring a time factor into the equation. Rabat, subject to irregular rainfall and marked seasonal variations, is vulnerable in this regard: the amount of water in the Bouregreg basin is substantial in times of flood and practically non-existent during the dry season.

ISTANBUL, THE MEGAKENT: A MAGNETIC MEGACITY

With its strategic position straddling two continents, Istanbul is a cultural and ethnic melting pot which has enjoyed a position of power and international influence for thousands of years. The city exerts such powerful appeal that its population had grown to 13 million in 2012 (having tripled between 1945 and 2007), which earned it the nickname megakent – megacity. Demand for water is constantly increasing in proportion to population growth and urban development.

RABAT, A COMPOSITE CITY

Rabat has a particular layout that reflects the city’s history.

It has developed in concentric circles around the medina, its historical centre. The area around the old town is divided up by long avenues, and upscale residential districts, such as Hay Riad, Souissi and Route de Zaër are interspersed with working-class districts along the Atlantic coast (Akkari, Yacoub el Mansour, Hay el Fath) and the Bouregreg river (Douar Dourm, Takaddoum, Hajja, Maadid, Hay En-Nadha).

Salé on the other hand looks more like a jigsaw puzzle made up of heterogeneous districts: a mixture of partly restructured informal settlements (Sidi Moussa, Tabriquet, Kariat Oulad Moussa) and relocation districts (Hay er-Rahma, Moulay Ismail, etc.). The richer residential districts are less extensive (R’mel, Bettana, Hay Essalam).

The mixture of different types of housing makes it difficult to supply mains water to the majority of the population, and disparities in income between residents complicates infrastructure funding. The expansion of housing districts without mains water also leads to tension due to problems of resource pollution and insalubrity against a backdrop of water stress across the nation as a whole.

1 Rabat City Profile – UN-Habitat
season. These factors call for complex, rigorous planning. The wilaya (province) has 24 storage tanks holding enough water for 29 hours’ use.

In order to meet the current and future needs of consumers, the two cities began monitoring the quality and quantity of their water resources according to meteorological parameters, with a view to protecting the natural environment and providing the infrastructure to minimise the risk of shortages.

In the Bouregreg valley, the threat is mainly of climatic origin (lack of rainfall and excessive heat), while on the shores of the Bosphorus it is more a matter of geology (seismic shocks weakening pipe systems). Rabat and Istanbul have identified priorities and actions that reflect the specific risks they are exposed to, which are in turn perceived, accepted or contested differently by the users.

Topography, climate and hydrology form a complex alchemy which gives rise to conflicts of varying duration and intensity, involving different stakeholders in both cities. The entire population of each area is subject to the same geographical constraints; conflict is exacerbated by the shortage of water and tends to be focused on distribution and the attitudes of the various stakeholders towards the fragile natural environment.

### FROM THE SEA TO THE LAND...

Because Rabat is located at the mouth of a river, it is subject to the specific hydric risk known as saltwater intrusion, where the groundwater becomes contaminated with seawater.

This occurs when the groundwater level falls too low; the direction of flow is reversed and saltwater enters the freshwater aquifers making the water unfit for consumption.

Although a natural phenomenon, saltwater intrusion is increased by groundwater pumping and the pollution is often irreversible.

### THE ONLY CITY IN THE WORLD SPANNING TWO CONTINENTS

Istanbul is in a unique position: bordered by the Black Sea to the north and Sea of Marmara to the south, the city is sliced in two by the Bosphorus, the dividing line between the continents of Europe and Asia. Istanbul is also situated in one of the most seismically unstable areas in the world, at the end of the North Anatolian Fault, a strike-slip fault system almost 1,000 kilometres long which crosses Turkey from east to west and divides the Arabian Plate to the south from the Eurasian Plate to the north.

As a result, the region has suffered many earthquakes in its history, some of which have been of devastating intensity. Istanbul is bracing itself for the ‘big one’, Büyük deprem in Turkish, an earthquake measuring more than 7 on the Richter scale, which is likely to occur in the Sea of Marmara, 30 kilometres at most from the centre of Istanbul, and which seismologists are predicting will happen in the next 30 years. A major risk for the city’s 15,000 km of water production and distribution pipes.
A Dynamic, Multipolar Space

Owing to the limited space and high population growth rate, Istanbul has a very high urban density. During the 1980s and 1990s in particular, the authorities implemented a policy of peri-urbanisation to ease congestion in the centre and allow the city to develop according to a multipolar model. Istanbul therefore has a complex network of pipes and demand for water is high throughout the city and outskirts.

Water quality also comes into the picture, with the development of informal settlements which have progressively taken over the watersheds and the forests that used to surround the city.

Upgrading of Drinking Water Supply in the Rabat–Casablanca Coastal Area (2010-2013)

Due to increased tourism and urban development along the Rabat–Casablanca coastline, the drinking water supply system will reach the limit of its capacity by 2013. This project aims to meet the region’s drinking water demand until 2030.

The new system has been designed to satisfy the priorities identified by the Moroccan water authority (ONEP) within the framework of the country’s national water strategy. It is made up of a production component, which consists of a new pumping station, force main and treatment plant, and a transport component involving the construction of a treated water supply main.

Key Figures

- Istanbul is the world’s 7th most popular tourist destination
- Rabat’s annual rainfall: 450 mm
- Population growth in Istanbul in the last 60 years: 95%
- Volume of water taken from the Bouregreg and Chaouia drainage basin in 2010: 300 Mm³
- Population of Salé and Rabat respectively: 900,000 vs 650,000
- Earthquakes measuring more than 6 on the Richter scale have occurred in the region of Istanbul in the past 50 years: 12
- Earthquakes measuring more than 6 on the Richter scale have occurred in the region of Istanbul in the past 50 years: 12
- Length of coastline adjacent to Rabat: 60 km

Ahmet Mete Saatçi
Department of Environmental Engineering, University of Marmara (Turkey)
Taking Action
FINDING SOLUTIONS TO THE PROBLEMS CAUSED BY HUMAN ACTIVITY

“Managing the water cycle sustainably calls for a combination of shared governance and pragmatic decision-making”

SOUND PRINCIPLES AND EFFICIENT DAY-TO-DAY MANAGEMENT

Legislation aims to reinforce a collective approach to water management in order to avoid possible conflicts upstream. It defines distribution criteria and orders of priority for water use, to ensure optimum use of the resource in the interest of all.

Istanbul and Rabat both have a complex legal landscape due to several key legislations, although principles of subsidiarity apply. In both cases, the coexistence of several arbitration and decision-making hierarchies is a legacy of their rich cultural history.

In the Maghreb, for example, land policy is sometimes in contradiction with melkia, a traditional Muslim legal system. In Istanbul, the overlaps between municipal and provincial lines of authority become more of a problem in water management as the city expands. It can take time to define the status of new districts on the boundaries. To be able to reach an understanding and come up with solutions to resolve conflicts of use, a common frame of reference is essential.

Enlightened water governance in fast-developing urban areas calls for centralised coordination and tailoring to specific requirements. Two action models exist: decentralisation of water management competencies and distribution of roles between public and private sector stakeholders. Istanbul and Rabat have both opted for a mixed management method. Water is produced by public utilities while distribution is entrusted to private operators (KUZU in Istanbul and REDAL in Rabat).

HARMONISING LEGISLATION AND FORMULATING A NATIONAL WATER POLICY: THE 10.95 LAW

In 1995 Morocco adopted the 10.95 law which lays down five basic principles for the country’s water management policy:

1. State-owned utility: water is a public good and the right to use it is granted by the government subject to certain conditions;
2. A unique resource: recognising the uniqueness of water leads towards a sustainable integrated management policy, coordinating actions and involving the various stakeholders at the sectoral and territorial levels;
3. Economic value: assigning an economic value to water opens up the possibility of applying the ‘user pays’ and ‘polluter pays’ principles, which in turn leads to a rationalised approach to managing the resource;
4. National and regional solidarity: multilevel solidarity legitimises inter-basin transfers as well as the application of a pricing mechanism for redistribution between the various users;
5. Consultation in water management: a consultation process is set up at national, regional and local level between services, users and elected representatives as a way of defusing conflict and increasing stakeholder awareness of water-related problems.

R&D TO THE RESCUE

Conflicts of use are exacerbated in times of crisis, especially when extreme climatic events or earthquakes occur. Istanbul is particularly at risk from seismic activity and it is for this reason that the water industry has developed special equipment and procedures to help restore access to clean water in sufficient quantity.

Since 1998, Veolia Environnement has been training and supervising employees as emergency volunteers. About a hundred humanitarian operations have been carried out in conjunction with public sector players and international NGOs. In 1999, for example, the Istanbul region was hit by two devastating earthquakes: the first, measuring 7.4 on the Richter scale, hit Izmit on 17 August and the second (7.2) hit Düzce on 12 November. Teams stepped in to assess the damage and bring in mobile water treatment units, each capable of supplying clean water for 5,000 people.
Storing, treating and transporting freshwater and taking away wastewater each involve their own organisational and technical challenges.

The infrastructure, tailored to the city and the needs of its inhabitants, must meet constraints of sizing, resistance, maintenance and user access. In the narrow alleyways of the Rabat and Salé medinas, REDAL uses mini jetties to clean the sewers. Istanbul, with a population of 13 million, has gradually acquired an extensive network consisting of 15,000 km of water mains fed by five production plants and 12,500 km of sewers serving 14 wastewater treatment plants.

The question of infrastructure financing is also important. In the poorer districts of Istanbul and Salé, supplying mains water to an ever-growing population further and further out from the centre does not always follow the classic financing model.

The operators have consequently implemented some ingenious financing policies based on a principle of solidarity between different income levels, enabling the poorest sections of the population to have access to mains water.

Sustainable water resource management involves minimising the threats of overuse and anthropic pollution by taking preventative measures. Protecting the environment against the pressure of human activity is a necessary preliminary to any conflict management policy.

The fact that an increasing number of factors (technical, cultural, economic and environmental) need to be taken into account stretches out the decision-making process, although it should ultimately lead to more effective action.

THREE INITIATIVES TO IMPROVE ACCESS TO DRINKING WATER FOR ALL

The Rabat-Salé municipal authority and REDAL have introduced a rationalised standpipe (ṣaqayṭi) system to replace the network of free public standpipes which was a source of tension among users owing to the wastage, unequal access and overuse by some parties. The ṣaqayṭi system rationalises water use and ensures fair distribution since access is restricted and regulated by a prepaid card system. The council compiles a list of the most disadvantaged families in each district and provides them with prepaid cards entitling them to 30 litres per person per day of free water. The ṣaqayṭi system has eased conflict and rationalised water consumption in the districts concerned.

The essential extension of the distribution network is a costly operation and the water rate, estimated at 3% of a household’s income, would be difficult to increase based on the recommendations of the international organisations. The infrastructure costs cannot therefore be included in the water rate and new users requesting a mains connection are sent a separate bill for this service. Many families in the poorest districts cannot afford this initial connection charge. To solve the problem, Rabat city council launched a social connections programme in 2002 according to guidelines issued by the World Bank. The idea is to offer microloans to users who cannot afford to pay the connection charge outright. The repayments are spread over a seven-year period in monthly instalments that the poorest families can afford. The programme, which has also been introduced in Tangiers and Tétouan in the north of the country, will eventually give almost half the families not connected access to the public drinking water supply network.

The Moroccan capital has also introduced a welfare pricing scheme offering four price brackets corresponding to the level of consumption. In the lowest bracket, the charge is less than the cost price, which means that households using no more than 6 m³ per month (i.e. 40 litres per person per day for a family of five) benefit from cross-subsidisation whereby they are effectively subsidised by users in the three higher usage brackets (7, 20 and 40 m³ per month).
“Over the centuries, the authorities in the Mediterranean have found solutions to the region’s water problems and ensured that the resources available are managed fairly. They have adopted risk prevention and management techniques in three main areas: drinking water, wastewater and stormwater runoff.

To manage risk effectively one has to know what the risks are. This calls for the accurate interpretation of technical data and the development of technological solutions. However, action can only be really effective if it is accompanied by a transfer of knowledge on vital issues that concern everyone. For this reason it is essential that municipalities increase public awareness and educate their citizens. Sharing information, ensuring transparent governance and developing networks to encourage dialogue are some of the measures they can take to ensure efficient water resource management. A decision-support tool, described in the white paper on water in the Mediterranean, is currently being put together.”

LIMITING ANTHROPIC POLLUTION: THE EXAMPLE OF THE ÖMERLI BASIN

As a consequence of high population growth and the resulting urban sprawl in Istanbul, illegal settlements have been developed around the Ömerli basin, located on the Asian side to the north-east of Istanbul. The Ömerli basin is one of the city’s main sources of drinking water.

Wastewater from these informal settlements is discharged untreated into the natural environment and is threatening the water resources in the basin. Physical, chemical and biological tests of the water quality have revealed abnormally high levels of phosphorous for example, which would explain the eutrophication that has directly affected Istanbul’s water supply system, sometimes making it unfit for human consumption.

Significant measures have been introduced by the public water utility in Istanbul (ISKİ). Access to and use of the land around the water resources is now controlled by a system of four concentric conservation zones with increasingly stringent regulations the closer they are to the reservoirs, so reducing pollution from construction, agriculture, extraction and road traffic. ISKİ also plans to build a new wastewater treatment plant at Paşaköy, which will have a capacity of 125,000 m³ per day.
Anticipating
**RATIONAL USE IN KEEPING WITH THE NATURAL WATER CYCLE**

“Rethinking the urban metabolism to lessen the regions’ impact on the environment”

**MANAGING DEMAND INSTEAD OF SUPPLY**

Looking ahead, Rabat and Istanbul face three specific challenges: they must satisfy increasing demand for water, prevent further deterioration of the resource and adapt to the effects of climate change.

To meet the needs of future generations, both cities are taking steps to anticipate and minimise the risks, whether of natural or anthropic origin. Public integrated water resource management schemes are being developed to protect ecosystems and ensure resources are used sustainably. Overuse of the resource in many basins around the Mediterranean means that a significant increase in supply is not an option because it would only exacerbate conflict, especially with the communities living close to the withdrawal sites.

The water cycle needs to be looked at from a different angle in order to move towards a more resilient and sustainable economy; water demand needs to be changed. Demand is soaring in large urban areas where densification, expansion and rational use.

**INCREASING SUPPLY IS NO LONGER THE ANSWER TO ISTANBUL’S WATER PROBLEM**

To meet the ever increasing water needs of its inhabitants, Istanbul has made intensive use of its water sources and turned to basins further from the city to provide more. Successive projects increased the city’s water supply capacity from 590 million m³ per year in 1994 to 920 million m³ per year in 2000.

The Melen system (1997-2008) brings water from the river of the same name to Istanbul through 150 kilometres of pipes and tunnels, including one underneath the Bosphorus. The aim is to meet the needs of the population until 2040, by which time it will have supplied a total of 1,180 billion m³ of water. This is complemented by the Yeşilçay system which conveys water from the Göksu and Çanak rivers to the north-east of the city, supplying 145 million m³ of water to 1.5 million Istanbulites annually.

Despite these projects, it remains difficult to satisfy demand and the old approach of searching for new sources is running out of steam. New sources are found further and further away from the city and are increasingly difficult to exploit, and the underground reservoirs are unusable, having been either drained by excessive use or polluted. Interbasin groundwater transfer is not a zero-sum game since the balance of the supply basin is altered not to say threatened. This can have an impact on the entire region’s water supply.

Istanbul is now putting its energies into finding new solutions that give priority to reducing demand rather than increasing supply.

**DEPLETION OF RESOURCES AND CONFLICTS OF USE IN THE MAÂMORA FOREST**

The Maâmora forest, situated on the periphery of the Rabat-Salé urban area close to the sea, is blessed with good quality groundwater reserves. However, illegal pumping for agricultural use is depleting the aquifers and causing a partial saltwater wedge. Overgrazing in the forest is also threatening groundwater quality.

Morocco’s 10.95 water act clarified the permitted uses of the resource and regulates well use, in contradiction of the customary law that was traditionally applied. In these times of water stress and scarcity, farmers nonetheless view the use of groundwater resources as a fundamental right that is essential for their livelihood. The conflicts that arise make it difficult to implement water resource protection schemes in this area, and can only be resolved through a process of consultation and raising awareness.
higher standards of living are leading to a higher per capita consumption rate. Making economic growth a priority is perfectly understandable although it has for a long time been difficult to reconcile it with a rigorous approach to managing an increasingly scarce resource. However, the initiatives being set up show that rationalising water use does not hinder development in high-growth sectors but on the contrary guarantees the continuance of such activities in the medium and long term. Such progress relies on looking at the situation as a whole (for example, taking the concept of virtual water into account in strategic agricultural choices) and calls for concrete water saving measures, especially through widespread use of water-efficient equipment.

To preserve and improve the quality of the resources available, both Rabat and Istanbul are concentrating on extending their existing sewerage networks and financing new infrastructure. In Istanbul, ISKI upgraded and automated all its treatment plants between 2003 and 2010. In 2010, the megakent started work on a new biological plant with a treatment capacity of 600,000 m³ per day at Ataköy in the south-west of the city, to treat wastewater from Bakırköy, Bağcılar, Bahçeşehir, and part of Küçükçekmece and Gaziosmanpaşa, serving a total population of more than 2,500,000.

The growing infrequency and irregularity of rainfall coupled with the increase in extreme climatic phenomena (desertification, flooding, etc.) due to global warming will require a substantial effort to adapt. Reconciling supply and demand is still a complex equation to solve. Innovative technical, organisational and societal solutions in the water sector will play a part (intra-sectoral approach), but the most seriously affected cities will not be able to avoid revising their urban planning strategy (inter-sectoral approach).

Sustainable planning in harmony with ecosystems calls for rational water use by every category of user and wastewater recycling or reuse to satisfy other needs. Design work began in 2007 on a new eco-town, Bab Zaers, south of Rabat, to accommodate future inhabitants of the capital, where urban sprawl is reaching its limits. The town is designed to be water self-sufficient thanks to a retention system, rainwater collection (special roofs, collection tanks, small dams, etc.), surface drainage and recycling.

THE CHALLENGE OF MOROCCO’S COASTAL WATERS

In 2002, the wilaya of Rabat-Salé, in partnership with REDAL, launched a project to clean up and develop the Bouregreg valley and the nearby section of the Atlantic coast.

The project consists of developing the infrastructure to collect and treat all the city’s wastewater, amounting to about 200,000 m³ per day, and discharge treated wastewater in the Atlantic at some distance from the coast and beaches.

The project is divided into 3 phases:

• Provision of a wastewater interception system for Rabat, Témara, Salé and Bouknadel.
• Construction of a treatment plant in Rabat for preliminary treatment of wastewater prior to discharging into the sea.
• Installation of a marine outfall which discharges treated wastewater 2 km offshore.

The development project protects the environment and coastal and river ecosystem at the same time as making a better environment for the two million people living in the wilaya. Improvement of the sea front will also boost tourism.

More widely, the project is part of Morocco’s national master plan for liquid sewage and wastewater treatment. Work began in 2005 to improve and expand the network and build wastewater treatment plants, with the following objectives:

• To increase the overall percentage of users connected to mains drainage to 80% by 2020 and to 90% by 2030.
• To reduce domestic pollution by 80% by 2020 and by 90% by 2030.
• To reuse/recycle 100% of wastewater by 2030.
iStanbul in 2050: urban and environmental transformation

The constantly changing city of Istanbul now ranks among the world’s megacities and aims to provide quality services to its ever-increasing population and visitors. A number of large-scale development and infrastructure projects are either planned or underway. The Marmaray rail project linking the European and Asian parts of Istanbul by means of a 13.6 km tunnel under the Bosphorus, and construction of a third airport capable of serving some 150 million passengers a year (making it the world’s biggest airport) are drastically altering the flow of people and goods, which will in turn transform the urban metabolism.

Thanks to these projects, thought is being given to the city’s environmental impact. Progress has already been made with the biogas energy recovery system introduced at the Ataköy wastewater treatment plant, and other more futuristic projects, such as the HavAd man-made eco-island in the Bosphorus.

To lessen conflict between water resource users and anticipate the water-related challenges that might arise in the medium and long term, it is essential to implement an efficient integrated water resource management policy. The AGIRE programme operates on the basis of international cooperation, with the support and assistance of the German Agency for International Cooperation (GIZ). Its objectives are to improve the institutional, regulatory and organisational framework of the water sector in Morocco, boost the technical capabilities of those involved, and improve communication and dialogue between the various stakeholders (including their involvement in the planning process). The programme offers solutions to water-related problems at drainage basin level by developing practical tools adapted to local situations, to help prevent tension arising between resource users.

FARAH EL AOUFIR
Integrated water resources management support programme (AGIRE)
Moroccan Ministry of Energy, Mining, Water and the Environment

“Istanbul in 2050: Urban and Environmental Transformation

The constantly changing city of Istanbul now ranks among the world’s megacities and aims to provide quality services to its ever-increasing population and visitors. A number of large-scale development and infrastructure projects are either planned or underway. The Marmaray rail project linking the European and Asian parts of Istanbul by means of a 13.6 km tunnel under the Bosphorus, and construction of a third airport capable of serving some 150 million passengers a year (making it the world’s biggest airport) are drastically altering the flow of people and goods, which will in turn transform the urban metabolism.

Thanks to these projects, thought is being given to the city’s environmental impact. Progress has already been made with the biogas energy recovery system introduced at the Ataköy wastewater treatment plant, and other more futuristic projects, such as the HavAd man-made eco-island in the Bosphorus.

Farah El Aoufir
Integrated water resources management support programme (AGIRE)
Moroccan Ministry of Energy, Mining, Water and the Environment

**Key Figures**

- **17** wastewater reuse projects underway in Morocco
- **330** bird species: the Maâmora forest is a biosphere reserve
- **200 000 m³** volume of wastewater produced daily in the Rabat-Salé urban area
- **20 m²** area of green space per head of the population in Rabat
- **16** settling tanks at the Ataköy treatment plant
- **4 700** plant species
- **1 180 billion m³** volume of water supplied by Istanbul’s Melen system
- **326**
**Key concepts**

**Eutrophication**

Eutrophication is a form of pollution that occurs when excessive amounts of nutritive substances such as nitrates and phosphates are added to an aquatic ecosystem. It can occur as a result of human activity when nitrates, phosphates and organic matter are discharged into the environment. The effects are numerous and varied, including changes in the physical and chemical properties of the water, excessive aquatic plant growth, dissolved oxygen depletion, fish mortality and reductions in aquatic animal and plant populations.

**Water exploitation index (WEI)**

Measures the relative pressure of annual withdrawal on conventional renewable freshwater resources and expresses a country’s vulnerability to cyclical shortages. It highlights usage levels and the need to adjust policy as regards supply and demand. Limited availability of water resources can have negative effects on the economy, local development and the biodiversity of aquatic ecosystems.

**Low water**

Low water is the time of year when a river reaches its minimum flow rate. France has introduced localised low-water management schemes (PGE) to ensure availability for human activities (industry, drinking water supply, tourism and leisure activities, etc.) during low-water periods, without compromising the natural functioning of the aquatic ecosystem. PGEs define rules for sharing the resources available and set abstraction limits.

**Ecosystem services**

These are the benefits, either direct or indirect, that people derive from ecosystems. Ecosystem services are grouped into four categories:

1. **Supporting services**: not directly used by people but which are necessary for the proper functioning of ecosystems (nutrient recycling, primary production);
2. **Provisioning services**: (or withdrawal): those which result in usable products (food, materials and fibres, freshwater, bioenergies, biochemicals and pharmaceuticals);
3. **Regulating services**: the ability to control, for human benefit, processes such as the climate, the occurrence and spread of disease, various aspects of the water cycle (flooding, low-water levels, physical and chemical properties, erosion), air quality and pollination.
4. **Cultural services**: the use of ecosystems for recreational, aesthetic and spiritual experiences.

**Water efficiency index**

A means of monitoring the amount of water saved as a result of demand management measures and by limiting loss and wastage during transport and use. Water efficiency is measured in three categories: drinking water (physical efficiency of drinking water supply systems and ability of management bodies to recover the costs after use); agriculture (efficiency of irrigation water transport networks and efficiency of the various methods of plot irrigation) and industry (recycled water volumes).

---

1. Futura environnement, CNRS, Actu environnement
2. Plan bleu
3. Interdepartmental agreement for the Lot basin
4. French Ministry of Foreign Affairs (MAE), 2005
5. More efficient water use in the Mediterranean, M. Blinda – Plan Bleu Paper
Key concepts

**Water demand management (WDM)**

Complementary to water supply management (WSM), which covers actions such as damming, pumping, pipelining, conveyance and desalination, WDM refers to the measures and organisational systems that societies and governments can implement to manage the resource more efficiently from a technical, social, economic, institutional and environmental standpoint. WDM aims to reduce physical and economic losses for current and future generations and better satisfy their demands for both quantity and quality.

**Water demand management (WDM) tools**

WDM covers all the measures intended to increase technical, social, environmental and institutional efficiency related to water use. WDM tools fall into five broad categories:

- **Technical tools**: to improve canal streamflow processes, increase efficiency of irrigation methods, reduce vulnerability of agronomical models and cultivation systems, use of supplemental irrigation, irrigation planning and management tools;
- **Economic instruments**: pricing, quotas, financial assistance, usage fees, agri-environmental measures, cross-compliance;
- **Regulation and withdrawal control**: withdrawal declaration/authorisation system, temporary restrictions linked to hydroclimatic fluctuations, compulsory metering of withdrawal volumes, ‘water police’;
- **Planning and consultation tools**: devolved management units, user and irrigator associations, NTIC (WDM support software);
- **Training and awareness tools**: public and farmer awareness campaigns, agricultural advisory services, training of agricultural engineers, farmers and technicians.

**Cost-benefit analysis (CBA)**

A method used to assess the economic and financial advantages of water demand management measures. CBA compares the benefits and costs of a project (capital outlay, financial costs relating to volumes saved, environmental and economic externalities, etc.). If the cost/benefit ratio is higher than 1, the project is deemed to have a positive value.

**Wadi**

A dry riverbed in desert regions through which water flows intermittently. A wadi is fed almost exclusively by surface runoff and usually drains into a closed depression or disappears as a result of depletion.

**Cisterns**

An underground reservoir fed by drainage (for example in Andalusia) or by an aqueduct. The capital of the Byzantine Empire (present-day Istanbul) had numerous cisterns, the most famous of which, the Basilica Cistern (Yerebatan Sarınço) and the Cistern of Philoxenos (Birbindirek), can still be visited. They consist of rectangular chambers with a vaulted ceiling supported by hundreds of columns.

---

6 Programme Solidarité Eau
7 Economic evaluation of water demand management in the Mediterranean – Plan Bleu study report
8 Larousse
9 Techno Sciences
TOWARDS A NEW MANAGEMENT MODEL: FOSTERING INNOVATION THROUGH COOPERATION

The issue of water is of major strategic importance in the Mediterranean, and the most efficient way to meet its many challenges is through cooperation at regional level.

By way of illustration, this document examines two case studies that bring to light two distinct sets of water-related problems: Rabat, where the issue is resource scarcity; and Istanbul, where exploding demand for water is a major factor.

These situations, though different, nonetheless share common solution strategies. We find similarities between the adaptation plans implemented, where both cities have taken action throughout the water cycle by managing supply as well as demand.

It makes sense to adopt a holistic view that takes all aspects of water into account, including its impacts, whether we are talking about the human water cycle or the natural water cycle, within a country’s social water projects. We need to put heads together to rethink our existing water management systems and develop new models of supply, storage, consumption and use, recycling, treatment and discharge into the natural environment.

It is essential for municipalities to join forces to find intelligent solutions that bring mutual benefits and foster synergy in environmental, economic and social contexts. Dialogue, consultation and cooperation encourage the sharing of information, the exchange of knowledge and techniques and the pooling of resources to help people throughout the Mediterranean live together more harmoniously.

In line with this, the Union Pour la Méditerranée (UPM) is working closely with regional and international stakeholders to strengthen integration and cohesion between Euro-Mediterranean partners. Water management is a priority for the UPM and on 28 and 29 May 2013 it launched a project entitled ‘Water sector governance and financing in the Mediterranean’, conceived and managed jointly by the Global Water Partnership-Méditerranée (GWP-Med) and the Organisation for Economic Cooperation and Development (OECD). The aim of this regional project is to analyse the main governance challenges to mobilise funding for the water sector in the Mediterranean and reproduce best practice observed in the region and elsewhere, paying particular attention to the role of public-private partnerships (PPP).
HSH Prince Albert II of Monaco set up his Foundation in June 2006 in order to address our planet’s alarming environmental situation. The Prince Albert II of Monaco Foundation is dedicated to the protection of the environment and the promotion of sustainable development. The Foundation supports initiatives in the fields of research and technological innovation, and activities focused on the social issues at stake.

The Foundation funds projects in three main geographical regions: the Mediterranean Basin, the Polar Regions and the Least Developed Countries. The Foundation concentrates its efforts in three main areas: climate change and renewable energies, biodiversity and water management.

www.fpa2.com
Veolia Environnement

Veolia Environnement is the world leader in environmental services. With operations on every continent and more than 310,000 employees, Veolia Environnement provides customised solutions to meet the needs of municipal and industrial customers in four complementary segments: water, environmental services, energy services and passenger transportation. The quality of their research, the skills and synergies of their teams, their expertise in the public-private partnership model and their commitment to sustainable development have made them a benchmark player in the environmental field.

www.veolia.fr

International Office for Water

For 20 years, iOWater has supported international stakeholders in capacity building and developing a framework for better water management through:

- **Studies, advice and twinnings**
  - Strengthening skills at local, national and international level.
  - Drawing up strategies and supporting policies of good water resource governance and pollution control in the main sectors (water supply and sewerage, industry, energy and agriculture).

- **Professional training**
  - Catalogue-based and tailored training programmes.
  - Assistance with establishing water training centres.

- **Data and information management**
  - Implementing solutions for managing information about water and making it accessible.
  - Standardising data exchange.

iOWater is responsible for the administration of the International Network of Basin Organisations (INBO) and runs EMWIS (Euro-Mediterranean Water Information System).

www.oieau.fr

United Nations Institute for Training and Research

The United Nations Institute for Training and Research (UNITAR) delivers capacity building to thousands of beneficiaries around the world through training and research in the fields of the environment, peace, security and diplomacy, and governance. Within the Governance Unit, the Local Development Programme (LDP) builds the capacity of local stakeholders towards sustainable development in order to help them meet the many challenges they face at local level. The Programme is an international platform for knowledge exchange, and for the sharing and dissemination of best practice and innovations implemented by towns and cities. It facilitates partnership building between the public sector, private sector and civil society at local, national and international level.

www.unitar.org

Plan Bleu

Plan Bleu is a Regional Activity Centre of the Mediterranean Action Plan, established under the aegis of the United Nations Environment Programme. It serves all the countries bordering the Mediterranean Sea and in the European Union that are contracting parties to the Barcelona Convention (1976). It also works in partnership with the Marseille Center for Mediterranean Integration and the Union for the Mediterranean. Its mission is to produce information and knowledge in order to alert decision-makers and stakeholders to the environmental risks and sustainable development issues facing the Mediterranean, and to forecast future scenarios to guide decision-making processes. As a key resource for development – agricultural development in particular – water has always been a major issue for Plan Bleu.

www.planbleu.org