

VII.B. Water in the Mediterranean Islands

1- MALTA

The Maltese Archipelago lies in the central Mediterranean between Sicily, Libya and Tunisia. It includes a group of small islands with a surface area of 316 km² and a population of about 400,000. The two mainland islands, Malta (246km²) and Gozo (67km²), are amongst the world's highest populated centres.

Natural water resources are scarce in the Maltese islands because of geographic and climatic conditions. Malta has neither any surface waters that can be economically exploited, nor any deep extensive aquifers that it can rely upon. Malta is among the first 10 top-ranking countries in global water scarcity with the highest competition index. Unconfined aquifers that are today under fierce competition by users and under the constant pressure of intense economic development, provide freshwater for around half of the municipal supply and for other purposes. As this is insufficient to meet all the water demand, desalinated water supplements the shortfall, and three desalination plants (Reverse Osmosis) produce today around 55% of the drinking water supply.

Projections show a steady growth of the local population up to 2025. Malta hosts around a million tourists annually, that when taken into account, aggregate the population figure to around 430,000. Industry and agriculture also tax heavily the water supply, with the latter alone estimated to consume around 40%¹ of groundwater. These figures are intended to place a perspective of the pressure for water resources in this Mediterranean island scenario.

Groundwater in Malta is today under the threat of anthropogenic activity and slowly depleting in quality and availability. Government is driving towards improved groundwater management and more sustainable practices that will ultimately lead to an improvement in the quantitative and qualitative status of the aquifers, now recognised as a strategic resource of freshwater.

As a new member in the EU, Malta has far reaching objectives driven by its obligations to harmonise with the *acquis*. It will need to comply with EU legislation including, among others, the Water Framework Directive (WFD), the Groundwater Directive, the Drinking Water Directive, the Nitrates Directive, the Landfill Directive, the Plant Production Products Directive and the Biocides Directive. Malta is now seeking to align fully with EU policy, while responding to the specific requirements of the Maltese community and its European partners.

The major challenges facing the water sector today and the development objectives are considered to be:

1. Meeting water demand by different sectors.
2. Achieving EU quality standards for drinking water supply.
3. Governance of water resources and fair allocation of water to all users.
4. Managing all water resources in an integrated manner, recognising the diverse requirements of different sectors of the economy.
5. Maximising efficiency and cost effectiveness in the use of water resources.
6. Applying "user pays" and "cost-recovery" principles effectively.
7. Restoration of the aquifers and protecting aquatic ecosystems.
8. Raising public awareness on water conservation.

¹ Base year 2003

In the coming years Malta will need to adopt a number of strategies to reform the water sector and achieve a level of water service that will buffer the rapidly developing economy from the constraints of water shortage.

Malta will seek to ensure that the most worthwhile beneficial use is made of groundwater while balancing abstraction and recharge. Our strategies will address issues of over-abstraction and salinity intrusion, restoration of base flows that support biota and ecosystems, and restoration of quality status.

Malta will also strive to keep abreast with the latest desalination technology to reduce the cost of producing desalinated water, by improving plant efficiency and by lowering energy input. Conjunctive use of desalinated water with groundwater will be key to the achievement of quality standards of the potable water supply.

High efficiency in the use of water will have to be ensured together with effective regulation that eliminates misuse, while ensuring a fair allocation of water based on socio-economic criteria. More emphasis shall be placed on the efficient use of water by farmers and the maximisation of crop yield through the use of hi-tech irrigation systems.

In the coming years, water conservation and the reduction of losses from the public water supply system will continue to feature high on Malta's water agenda. Saving water ultimately reflects on tariffs charged to consumers. A water conservation strategy does not necessarily mean depriving the use of water, but instead should be construed as the maximisation of benefits that can be obtained through diligent use.

Re-use of treated waste water will become increasingly important in Malta's overall strategy. Reclaimed water is a reliable resource, even during the dry season, and can thus substitute potable water for secondary uses. Agriculture and Industry are two potential sectors where treated sewage can be safely employed after suitable treatment. Decentralised treatment of sewage close or, at the point of use, needs to be also examined further as it will allow multiple usage of the effluent while doing away with expensive distribution networks.

Another issue that will be addressed in future is that of cost recovery. Water cannot be considered any longer as a free good as this will only lead to wastage. On the contrary water pricing policies will be based on social equity and will provide adequate incentives to use water wisely by deterring waste. Recovery of cost should be therefore based on economic considerations while subsidies will be only applied to alleviate economic burdens where critically required.

There is no room for waste and misuse of water. If used with diligence, Malta's water resources could be employed to suffice the needs of the community basic needs, provided that the Maltese recognise water as a common good. More public awareness on the merits of water conservation is therefore an essential element of our future strategy.

In an island like Malta, the community is faced with an over-riding obligation to use the few resources it has in the most rational and sustainable manner. Malta's economic activities must be geared in such a way as to recognise the natural scarcity of water and overcome this limitation in a sustainable manner.

Malta Resources Authority
Malta NFP for EMWIS

1- CYPRUS

Cyprus is situated in the north eastern part of the Mediterranean Sea. It is one of the ten countries that have joined the European Union in May 2004, as part of the EU expansion. Cyprus is the third largest island in the Mediterranean Sea with an area of 9250 Km². Forty percent (40%) of the area of Cyprus, is under Turkish occupation. The population in the government controlled area of Cyprus is about 700,000. Every year the island is visited by more than 2,5 million tourists.

Throughout its long history Cyprus has always been confronted with the problem of water shortage. Droughts are a very usual phenomenon and many times in the past Cyprus came close to desertion as a result. Cyprus has no rivers with perennial flow while rainfall is highly variable and droughts occur frequently. Based on a long series of observations, the mean annual precipitation, including snowfall, amounts to approximately 500 millimeters, whereas during the past thirty years (1973-2003) this amount was reduced to 460 millimeters.

Since groundwater is reliable, clean and most importantly cheap, water resources development in Cyprus initially focused on groundwater and until 1970 groundwater was the main source of water for both drinking and irrigation purposes. As a result almost all aquifers were seriously depleted because of overpumping and seawater intrusion was observed in most of the coastal aquifers. At the same time large quantities of surface water were lost to the sea so the development of surface water sources was made by the construction of a large number of dams. Today, the total storage capacity of the dams is about 310 million cubic meters (MCM) of water compared to 6 MCM in 1960, a performance which is really impressive when compared to other countries of the same size and development level.

Despite the work performed in the sector of water development, unfortunately, due to the increasing demand for water and the declining trend of rainfall, climatological changes and the greenhouse phenomenon, the available quantities of water for potable water supply and irrigation are not adequate.

In order to face the situation, desalination units were constructed aiming at rendering the water supply of the major residential and tourist centres independent of rainfall. In April 1997 the first desalination unit started its operation and in April 2001 the second desalination unit came on stream. The two units produce 33 MCM of water every year. This quantity, coupled with the quantity of water from the dams, constitutes a safe yield for the complete lifting of restrictions in the supply of potable water. After many years of hardship caused by supply restrictions, as of January 2001, each household in the government controlled part of Cyprus enjoys a continuous supply of water. The restrictions belong now to the past.

The government water supply enhancement policy is not limited to the subject of desalination, but also focuses on the exploitation of other non-conventional sources of water, such as the recycled water, the use of which releases equal quantities of good quality water. Recycled water, which originates from the treatment of the effluent of municipal sewage systems, is used for the purpose of irrigation of agricultural cultivations and for the recharge of underground aquifers.

In this respect, it should be noted, however, that over the years, the Government of Cyprus has come to realize that water, as a limited resource, must be carefully managed and that simply attempting to satisfy increasing demand by increasing the supply does not provide a sustainable solution. Hence, the Government of Cyprus has always pursued a more integrated and sustainable approach to water resources management tackling the water issue in terms of quantity, quality, health, conservation and protection and economics. Water

demand management has been practiced in Cyprus long before it acquired its name. Measures such as improved irrigation systems, water metering, rising block tariffs, water saving campaigns, subsidies, programs to reduce distribution losses, education and many more have been a tradition of the water authorities in Cyprus.

Water, however, should not be taken for granted. Lack of water is one of the most crucial problems of humanity. It seems that water is a good which nature will provide in less and fewer quantities, and therefore, it is a must that we use it properly and restrict its waste.

From the brief description above and from the history of the water situation in Cyprus the following potential issues can be analyzed.

1. Ways for and importance of cultivating Water Saving Conscience among the consumers, starting from an early age in schools, in the army, etc.
2. Water Conservation Measures.
3. Subsidization of water saving measures.
4. Subsidization of the use of non-conventional, 2nd quality, water resources.
5. Consumer reaction to desalination.
6. Consumer reaction to the construction of large waste water treatment plants.
7. Negative reaction of farmers regarding the reuse of treated sewage effluent and ways of minimizing this reaction.
8. Cost – Benefit analysis of centralized and decentralized waste water systems.
9. Implementation of the EU Water Framework Directive 2000/60/EC.

Water Development Department
CYPRUS NFP for EMWIS
May, 2005

1- SICILY

Sicily is the largest island of the Mediterranean Sea, placed in such a position that has made it, for centuries, the centre of many important historical events and being subject of conquest, immigration and emigration.

Sicily constitutes the largest Italian region with a surface of 25.684 km², including the main island and the numerous small islands scattered around it. The resident population, as resulting from the census ISTAT of 2001, amounts to 4.968.991 inhabitants and is substantially stationary in the medium term. The climate of the Sicily is typically Mediterranean, but the marine influence, which contributes to moderate the weather along the coast, is attenuated in the internal plateaus and the mountain ranges. The summer periods are long with insufficient or none precipitations and with intense sunshine. The winter although short, can be relatively cold, especially between middle November to February,. In conclusion the climate can be classified as Mediterranean semi-dry and sub-tropical.

The annual average temperatures oscillate around 17-18°C in the coastal areas, while they decrease to 13-14°C in the internal plateaus and to 8-9°C in the mountainous areas (except on Etna where they can decrease even to 2-3°C).

In the same periods the minimum and the maximum temperatures in the coldest and warmest months, are respectively 9°C and 32°C in the coastal areas, 7°C and 27°C in internal plateaus and 3°C and 24°C in the mountainous areas.

The precipitations, concentrated in spring and winter are distributed irregularly in the various sub-regions and varies from one year to another.

Consequently, the areas of the North and East of the Island are relatively rainy, especially on the mountainous ranges, (as an example the annual precipitation exceeds 700 mm/year in Palermo and 1.300 mm/year on Nebrodi) while the western and southern areas (interesting the southern provinces of Trapani, Agrigento, Caltanissetta and Enna) are arid, with an annual precipitation less than 500 mm. The annual average precipitation is approximately 650 mm and exceed 700 mm in two thirds of the territory.

The dryness index, that is the relationship between temperature and precipitation, oscillates between 20 and 30 for the major part of the Island (semi-dryness exclusively in summer), is between 15 to 20 (semi-dryness) for a good part of the southern hilly and coastal areas, and decreases to 10-15 (intense semi-dryness) in some coastal areas and in the plain of Catania. In all the areas precipitation varies a lot from one year to another, a phenomenon which has been emphasized over the last few decades.

The climatic characteristics described above, cause remarkable differences between the various zones of Sicily, as far as the water supply is concerned. Regarding surface water resources, the water bodies have been classified into 102 catchment basins (see figure 1), including the main, secondary and minor water courses. The most important are Simeto, the greatest river of the island, whose catchment basin has an extension of nearly 4,200 Km², Platani, Belice, the Imera Meridionale. In synthesis the significant water courses are 39; to these should be added 3 natural lakes, 31 artificial lakes and 12 transition waters.

With reference to groundwaters, 14 hydrogeologic significant basins have been identified, as represented in figure 2. The extensive areas of southern-central Sicily although without any significant water body, can count with some aquifers with natural characteristics not suitable

for drinking use. In some cases this water is not even suitable for other uses because of the elevated salinity content, due to the geologic characteristics of these areas (gypsum-sulphur complex). In the same areas some surface water bodies present salinity, which in some cases is very high.

As mentioned above Sicily is surrounded by many small islands, which are listed below together with their areal extension.

Island	Km ²	Island	Km ²
Archipelago of Eolie		USTICA	8,122
STROMBOLI	12,556	Archipelago of Egadi:	
PANAREA	3,444	LEVANZO	5,832
VULCANO	20,943	FAVIGNANA	19,907
LIPARI	37,322	MARETTIMO	12,148
SALINA	26,101		
FILICUDI	9,228	Archipelago of Pelagie:	
ALICUDI	5,155	LINOSA	5,441
		LAMPEDUSA	20,492
PANTELLERIA	84,555		

Regarding different uses of the water resources (domestic, agriculture and industrial), the total abstraction amounts to approximately 1.800 Mm³/year, of which approximately 400 Mm³/year comes from surface sources, some 30 Mm³/year are produced through desalination and the rest is extracted from aquifers.

The domestic uses (approximately 650 Mm³/a) cover the big city areas and the other agglomerates for a total of 390 municipalities. The industrial uses are concentrated in the two major industrial areas of Gela and Siracusa-Priolo, as well as in the smaller ones of Milazzo, Palermo and others.

The supply for agriculture uses is divided between the organisation aggregated by the eleven regional Land Reclamation Consortia and those directly managed by small agricultural companies.

Domestic water is supplied through local aqueducts, serving one or more municipalities, or through large aqueducts, conveying the water resource to the city areas of Palermo, Catania and Messina, or to the areas with water deficiency of Trapani, Palermo (inner zones), Agrigento, Caltanissetta and Enna. Water supply to the small islands is provided through desalination plants and/or the transport with tankers.

The water sector, although characterized by a widely diffused infrastructures, shows discrepancies caused especially by the remarkable level of water losses in the conveyance and distribution systems (average water losses in the island amounts to 50) and, on the other hand, to a not efficient use of abstraction and regulation infrastructures. Other critical aspect is due to the inefficient management together with an insufficient attention to assure a service level totally satisfactory to the customers. This has lead to the degradation of the existing water

infrastructures. In synthesis the sector can be considered "mature", in the sense that the infrastructure exists and coverage is adequate, but rehabilitation works and reorganization of the management are required.

The level of coverage for the different water services varies in the 9 Water Districts as follows:

- Water supply ranges from a minimum of 93.7 % to a maximum of 99.7%;
- Sewerage ranges from a minimum of 54.0 % to a maximum of 99.7 %;
- Waste water treatment ranges from a minimum of 29.0 % to a maximum of 93.4 %;

The reform of the Integrated Water Service (SII) is presently being implemented, as well as in the rest of Italy, through the adoption of Law 36/94 (Galli Act).

The Sicilian Region has organized the Integrated Water Services in two segments:

- i) bulk water distribution at regional level, constituted by large abstraction and conveyance infrastructures, supplying water resources to the water districts;
- ii) nine Water Districts (ATO), corresponding to the administrative limits of the nine Sicilian Provinces, with the responsibility to manage water supply, sewerage and waste water treatment at municipal level.

The main aqueducts of the bulk water segment have been given in concession for forty years to "Siciliacque S.p.A.", a joint-stock company, public-private mixed society, created through the transformation of the "Ente Acquedotti Siciliani - E.A.S."

The Integrated Water Service in Water Districts is presently in the process of being transferred in concession to external water companies. Presently only one of the nine districts has assigned the service.

The tenders for the services are based on the Water District Master Plans with an horizon of thirty years. To improve the infrastructures efficiency to the fixed level of service, will require significant investments (the forecasted investments amount to 6.400 million euro over the next 30 years; out of them nearly 2,200 are planned in the first 5 years). The investment will be financed through both public and private (tariff) funds.

The priorities that Sicily is facing in the near future are well synthesised in the "Framework Program Agreement", recently signed by the State and the Sicilian Region. The main strategic objectives, as far as the water sector is concerned, can be synthesised as follows:

- a) preserve surface and ground water bodies pursuing the objectives of quality indicated in the Water Framework Directive 2000/60/EC to improve the aquatic environment, to protect and safeguard all ecosystems connected to the water bodies;
- b) restore surface and ground water quality in order to render them suitable for fish and shellfish breeding, for bathing and where required even for drinking purposes;
- c) reduce the pollution of the surface and ground water bodies, implementing to full extent the directives 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community, 91/271/EEC concerning urban wastewater treatment, 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources;
- d) stimulate an integrated water resources policy aimed at sustainable use, based on a long term quantitative and qualitative protection of the water bodies, guaranteeing the multi-use through integration between the various typologies of utilisation;

- e) promote water demand management and re-use of treated wastewaters;
- f) Implement the integrated water services in order to rationalize management of the water resources, overcoming the local sectionalism, increasing efficiency in each sector and entrusting in particular, through tender procedure, the management of water services to private subjects.

The implementation of the regional policy in the water sector is presently under way. Among the others initiatives the following principal actions are worth to be mentioned:

- construction of the main infrastructures required for completing the interconnection of the major regional water schemes. Among them Sogesid has provided the design of “Reconstruction of Montescuro West Aqueduct” as part of the water supply system of west-central Sicily;
- redaction of the “Water Quality Protection Master Plan” at regional level, providing the classification of water bodies and definition of the necessary measures according to the Italian Law 152/99 in anticipation of the requirements of the Directive 2000/60/EC;
- preparation of the “Regional Aqueducts Regulatory Master Plan” defining the present situation and future requirements for the use and preservation of water resources designated for domestic supply;
- information campaigns promoting the reduction of water consumption, organised in collaboration with the Civil Protection Agency and Sogesid;
- reutilisation of treated waste water effluent for agriculture and/or industrial uses.

Another challenge is to solve the specific problems of the small Sicilian islands, specifically caused by their condition of insularity, and regarding water supply and collection and treatment of waste water.