

Tunis: Ecological Problems and Urban Solutions

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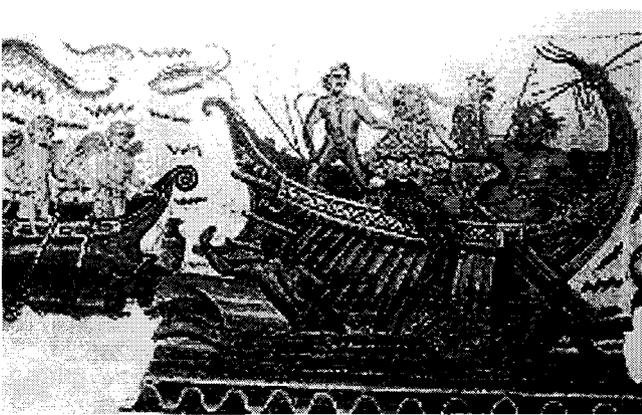


Fig. 1. *The wandering of Ulysses in the Mediterranean.*

On the shores of the Mediterranean, at the intersection of three continents, live a number of ethnic groups, with different characters, temperaments, sensibilities and intellectual capacities. Since ancient times, they have entered in contact with each other and established between themselves all sorts of relations: from war to commerce, exchange of things to religious convictions, from knowledge to methods. A mixture of blood, of terms, beliefs, legislations, political institutions has generated a vitality that could hardly be matched by any other region of the globe. But recent decades of over development, booms in tourism, over fishing, and pollution have left this oldest humanized landscape in the world in crisis (figure 1.)

MEDITERRANEAN ECOLOGICAL PROBLEMS

Being the world's largest inland sea with its 46,000 kilometers coast, a natural border shared by 20 countries, the Mediterranean is inhabited by more than 160 million people, a figure projected to double by the year 2025. Warmer and saltier than the Atlantic, which is the essential source of its waters, the Mediterranean is almost tideless. Because its waters are renewed only about every 100 years, it is also prone to pollution so much so that whatever gets dumped in this sea remains there for a long time. Fine beaches, charming scenery, traditional Mediterranean hospitality, and a precious history have made the whole region an exceptionally popular holiday destination (figure 2). Every year, 100 million local beachgoers and foreign tourists visit the region, and this figure is expected to triple in 25 years. Tourists, however, bring with them refuse that the Mediterranean countries are unable to cope

with. About 80 percent of the sewage they produce -more than 500 million tons a year- ends up in the sea entirely untreated! Most tourists come in the dry season, contributing to the contamination of the area's already limited water resources. Contaminated water, of course, is dangerous to health, and swimming in some parts of the Mediterranean can cause infections of the ear, nose, and throat, not to mention diseases such as hepatitis and dysentery and occasional cases of cholera. The economy of many Mediterranean lands, nevertheless, depends on tourism.

The Mediterranean is also a major transportation route between the Middle East and Europe, which results in heavy oil-tanker traffic. Over 20 percent of the world's oil passes through it. The amount of waste oil spilled into the quasi-closed each year has been estimated at 17 times the amount spilled by the Exxon Valdez in Alaska in 1989. Between 1980 and 1995, 14 tanker spills occurred in the Mediterranean, and each year, up to a million tons of crude oil are dumped from ships, often because harbors lack the facilities to collect waste oil or to clean tanks. The water that flows out of the Mediterranean to the Atlantic through the Strait of Gibraltar is deep. Since oil floats, the sea loses its deeper, cleaner water but tends to retain its accumulation of oil on the surface. The food chain of the Mediterranean is, consequently, marked by oil pollution. In 1990 the United Nations Environment Program (UNEP) reported that 93 percent of shellfish taken from the Mediterranean contained more fecal bacteria than the maximum allowed by the World Health Organization.

Added to this, a great damage is being done to the coast, much of which was thickly forested as the last 15th century. Deforestation, carried out to create farmland, to extend cities or to provide shipbuilding materials for Venetian galleys, has brought immediate erosion in its wake. In addition to the solids transported by rain, rivers carry down to the sea such pollutants as detergents, pesticides, and heavy metals. The Rhône in France, the Nile in Egypt, the Po in Italy, the Ebro in Spain, and other rivers carry increased quantities of agricultural and industrial waste. One direct result of this pollution is the red tides that have afflicted various areas of the Adriatic and Aegean seas, covering the beaches with a foul-smelling, glutinous sludge. This phenomenon is caused by eutrophication, a process that occurs when decomposing waste matter saps the water of its dissolved oxygen, suffocating much of the local flora and fauna. Other areas threatened by this phenomenon include the Gulf of Lions (France), the Lake of Tunis (Tunisia), the Gulf of Izmir (Turkey), and the Lagoon of Venice (Italy).



Fig. 2. Tourism: the village of Sidi Bou-Said

In an effort to address these environmental threats, concerned scientists and afflicted nations have tried to come up with solutions, with only partial success so far. In effort to deal with this alarming situation, the Mediterranean Action Plan (MAP) was adopted in 1975 under the auspices of UNEP. It aspires to commit the Mediterranean countries, as well as other members of the European Union, not only to protecting the sea from pollution but also to ensuring that coastal development respects the environment. In 1990 the Mediterranean Environmental Technical Assistance Program (METAP) was launched, which was succeeded in 1993 by METAP II. Other efforts to create nature reserves, sanctuaries, and marine national parks have yielded some commendable results in protecting dolphins, whales, monk seals, turtles, and other endangered species. Actions, however, have not adequately matched words. By the early 1990's, the MAP was close to collapse, as major contributor nations failed to pay their dues. According to authorities of the plan, not one of its objectives is known to have been achieved.

TUNISIA' POLICY OF ENVIRONMENTAL PROTECTION

Tunisia has undertaken an ambitious environmental policy that aims at preserving the ecological equilibrium, safeguarding natural and human resources, preventing and reducing the various forms of pollution, and reconciling the requirements of development with the imperatives of the environment. These actions are part of the national strategy for sustainable development, and in accordance with the principles of the 1992 Rio Conference. Accomplishments between 1992 and 1994 were characterized by increased attention to improving the living conditions and safeguarding the environment and natural resources. A long term strategy and an action plan have also been set, starting with the creation or the reinforcement of the existing technical, financial, institutional and legal tools necessary for a rational and sustainable management of the environment.

Since 1988, the Tunisian Government has created new institutions and reorganized the institutional framework for environmental protection, the core of which is now the Ministry of the Environment and Land Use Management and the agencies under its supervision: the National Agency for Environmental Protection (ANPE), the National Sanitation Authority (ONAS), the National Commission for Sustainable Development (CNDD) and the Agency for Coastal Protection and Planning (APAL).

The ANPE was created in 1988 as a special body dedicated to combating pollution, particularly from industrial sources. The ANPE has a twofold mission: to study and monitor the state of the environment in the country, and to work to eliminate all sources of degradation of the natural milieu.

ONAS was created in 1974 to fight water pollution and protect water resources. Its task is to manage the entire sanitation sector in residential, industrial and tourist regions. Its prerogatives were redefined in 1993 to strengthen its role as an institution working in the field of sanitation, and water resources protection.

The Ministry of the Environment and Land Use Management was created in October 1991 to complete the institutional system responsible for the environment and enhance efforts in this domain. The ministry is responsible, in collaboration with the other concerned ministries and agencies, for proposing a national policy with regard to protection of the environment and natural resources, improvement of living conditions, land use management, and for seeing to it that such policy is implemented. It is also responsible for promoting legislation in the areas of environmental protection, nature conservation, and land use management.

The National Commission for Sustainable Development (CNDD) was created in October 11, 1993 two years after the creation of the Ministry of the Environment and Land Use Planning, completing the institutional framework set in place since in 1988 to protect the environment and work for sustainable development. The commission's primary role is to coordinate the activities of the different national actors in development; its aim is to reconcile economic and social development with the protection of natural resources. The duties it has been assigned should result in the readjustment of national development programs, bringing them into harmony with one another so as to promote sustainable development. The commission is presided over by the Prime minister, and comprises twenty members: 11 from the government, two from the Chamber of Deputies, one from each of the major employers and union organizations, two representatives of the environmental protection associations, and the chairman of the ANPE, who chairs the commission.

The CNDD is assisted by a Technical Committee, chaired by the Minister of the Environment and Land Use Planning and composed of ministerial authorities responsible for environmental issues, representatives of organizations involved in the environment (ANPE, ONAS, the Agency for Energy control), and members of national research institutions (National Institute for Scientific and Technical Research, National Institute for Agronomic Research of Tunis). Members of the university teaching staff and representatives of non-governmental organizations also serve on the technical committee as non-permanent members, attending meetings depending on the themes to be covered.

The awareness of the importance and the necessity of an adequate coastal management with the appropriate tools for anticipation and decision making led, in 1995, to the creation of the APAL (National Agency for Coastal Protection and Planning) with the objective of improving the coastal space use and planning, preventing coastal environmental abuses and protect the natural coastal sites and the coastal public domain. This agency will be responsible for the protection and management of the whole Tunisian coast, which is about 1300 kilometers long.

TUNIS: ECOLOGICAL PROBLEMS AND URBAN SOLUTIONS

As the capital of the country, a crossroad of civilizations, but also a highly polluted city, with some serious geographical restrictions on its urban development, Tunis has launched the most ambitious urban and environmental program in the Southern Mediterranean. Three main operations ought be mentioned here: The Environmental Dredging of Lac Sud, The Greater Tunis Sewerage and Reuse Project, and The Lake Sejoumi Sustainable Project. Before going any further, let us first give a quick history of the city itself.

Tunis was founded by the Libyans, who in the 9th century BC surrendered the site of Carthage to the Phoenicians from Tyre. In 146 BC, during the Third Punic War between Carthage and Rome, Tunis

and Carthage were destroyed. The city flourished under Roman rule, but its importance dates chiefly from the Muslim conquest in the 7th century AD. It became the capital city under the Aghlabids (800-909) and reached its greatest prosperity under the Hafsid dynasty (1236-1574). The Holy Roman emperor Charles V took possession of it in 1535, and in 1539 the city passed into the hands of the Turks. It was retaken by the Spaniards, who held it from 1573 to 1574 but who were obliged to yield it to the Ottoman Empire, under which it remained until the French protectorate (1881-1956). Occupied by the Germans in 1942 and liberated by British forces and Allied troops in 1943, it became the national capital of Tunisia when independence was achieved in 1956. Ulysses

Geographically, Tunis opens into the Gulf of Tunis with its outer harbor, known as *La Goulette*. Built close to the base of the hills, it is separated from Carthage, its longtime neighbor, by a lagoon. Two other lagoons, Sejoumi and Ariana, surround this strangled city from the West and the North (figure 3.) For the last decades such a geographical setting, once a defensive advantage, has become a hurdle to the urban development and growth of the fast-growing city. In the mid 80's, and in an effort to address this complex geographical problem, the city of Tunis, with Middle Eastern investment and Dutch Technology, launched the famous Project du Lac. The project was mainly a large sanitation and urban rehabilitation operation. The lake was cleaned and linked to the Mediterranean sea at the Kram point, not far from the Carthage, to facilitate water circulation. Also hundreds of hectares were reclaimed, and a new urban zone -the *Cité des Berges du Lac*- was born on its northern shores. The new city includes: office, residential and diplomatic buildings. The operation was perceived as a success and, consequently, served as an example to be followed. That is how the "Lake Sud", "Greater Sewerage", and the "Sejoumi Sustainable" projects came to be.

LAKE SUD

This three year dredging project is underway to rehabilitate Lake Sud, situated between the city of Tunis and the Gulf of Tunis, and reclaim land for the required 23000 new homes. For many years Lake Sud, adjacent to the Megrine industrial zone, has been used as a wastewater disposal area; the large amounts of algae in the lake cause of a range of environmental problems for the local population indeed. Remediation of Lake Sud requires reclaiming some 900 hectares of the original 1,600 hectares. The \$65 million project, known locally as the environment project of the century, is certainly one of the most significant environmental projects ever undertaken in the Southern Mediterranean. The dredging joint venture, with DI and Van Oord ACZ as the leading contractors started in summer 1998 and currently employs 170 people (figure 4 and figure 5).

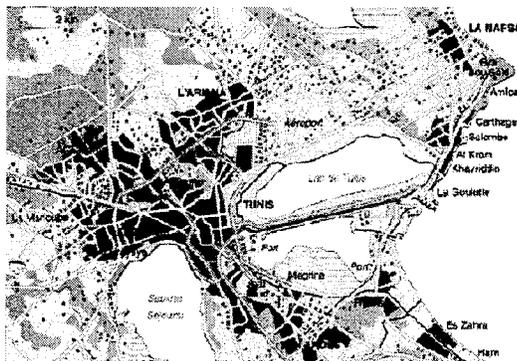


Fig. 3. The Grand Tunis

A six-month study phase was undertaken to predict the future ecological evolution of the lake and included the study of biological aspects. The outline of the lake will be transformed into a hydrodynamic shape to facilitate water circulation. The 20-cm natural tide will generate water circulation between the lake and the sea, renewing lake water every six days. The lake will be deepened from its 60 cm mean depth to minus 2 m and locks will be constructed to letting in the seawater at high tide and evacuating it at low tide. The existing access channel between the sea and lake will be rehabilitated. Current contamination levels and pollution were investigated and charting of the contaminated areas has enabled selective dredging. The project's civil works include some 15 km of dikes, an 800 m long breakwater which will serve as a water intake, a road and a railway bridge, two locks to regulate inflow and outflow, and a connection with concrete pipes to the existing port. A geological survey led to fine-tuning of the engineering of the dikes and for the calculation of fine sand quantities to be used for reclamation.

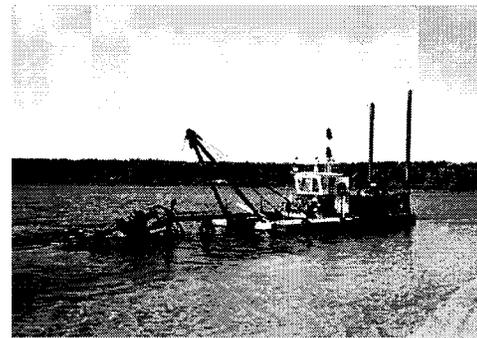


Fig. 4. Dredging in Tunis Sud

On completion of the works, the transformed lake will be limited to an area of 700 hectares. Reclamation of the other original 900 hectares requires the dredging of 7 million m3 of fine sand and 12 million m3 of silt and soft clay. Three cutter suction dredgers have been specially modified for work in shallow waters and assigned to the project. Dredging works started autumn 1998 and roughly a year later 10 million m3 of silt, sand and soft clay had been dredged, including 8km soil substitution for the dike construction, uncapping of some 60% of top soil from the 120 hectare borrow area in the lake. In addition to the three cutter suction dredgers, an auxiliary plant was mobilized, including survey and personnel launches, multicats, floating pipelines and landlines, a booster station, a spreader pontoon, a backhoe pontoon and 800m of floating silt screens. Site offices and a geo-technical laboratory for project support have been installed and a 10 hectare works yard west of Tunis is operational. Dike construction to separate the different reclamation areas is completed. The works are being financed by commercial, national and international sources, amongst which European Investment Bank (EIB), Dutch authorities (ORET) and Belgian authorities.



Fig. 5. Dredging in Tunis Sud

The new Lake Sud will provide Tunis with some 515 hectares public green area. The development will create housing space for the city's anticipated population increase to 2.7 million people by the year 2010. DI and Van Oord ACZ are the two leading partners in this joint venture, working with one other Belgian and one Italian partner. Thanks to this project, Tunis will add 850,000 residents over the next decade, a population increase of some 45%.

GREATER TUNIS SEWERAGE PROJECT

The objectives of this project are: (a) to improve service levels of urban sewerage up to the average level of potable water services; (b) promote efficient reuse of effluent from sewage treatment plants for agricultural purposes; (c) reduce urban and coastal pollution; (d) improve the National Sanitation Authority (ONAS)'s cost recovery and financial capacity, with the long-term objective of making it more autonomous and self-financing; (e) promote private sector participation; (f) introduce appropriate new sewerage technology; and (g) provide Technical Assistance to develop private sector participation in the sewerage sector. The project includes an urban sewerage component for ONAS and an agriculture component for the Ministry of Agriculture (MoA). The urban sewerage component for ONAS includes: (a) extension and rehabilitation of the Tunis South (Meliane) WWTP in the southern area of Tunis; (b) restructuring of the western Tunis sewage collection system to divert part of the sewage to the new Tunis West WWTP; (c) strengthening of the Southern Tunis sewage collection system and the connection of the urban areas of Mornag and Rades to the Southern Tunis WWTP, requiring the construction of 48 km of sewers; (d) extension of the Northern Tunis sewage collection system and construction of a liaison conduit of 4 km between the Northern Tunis and Choutrana WWTPs, replacing an open canal that obstructs groundwater drainage plain into Lake Ariana; (e) extension, rehabilitation and resizing of the sewage collection networks of Central and Northern Tunis (La Goulette and Le Kram), to prevent salty groundwater intrusion; (f) strengthening of secondary sewer systems; (g) construction of pumping stations; (h) acquisition of miscellaneous sewer maintenance and management equipment; and (i) technical assistance, studies, and research work.

The reuse of treated sewage includes: (j) the construction of a multi-seasonal storage basin with a capacity of one to two million m³, in the El Attar valley, at about 4 km distance from the Tunis West WWTP, where treated waste water will be stored to be used for irrigation; (k) the equipment of a first phase area of 1,000 ha in the El Attar area, to be irrigated with treated sewage; and (l) carrying out of a pilot project for groundwater recharge with appropriately tertiary treated purified sewage. Total Project Cost: US\$107.0 million. Loan Amount: US\$60.00 million

LAKE SEJOURMI

Sejourmi is located in the western sector of Greater Tunis in the basin of a Sebkhah (salted water lagoon) and covers an area of approximately 7500 hectares. The 1994 general census gives a resident total of 163,071 inhabitants within the Sebkhah of Sejourmi zone. Industry is the predominant economic activity within the zone, although it is somewhat weak, followed by services and commerce, and finally agriculture, which is beginning to be surrounded by urbanization and is in the process of disappearing. The Sejourmi area has a particular environmental potential, and is the site of significant degradation, due to rapid development and uncontrolled urbanization in the catchment area of the Sebkhah. Notable features include the encroachment of illegal housing on agricultural land, an increase in pollution sources entering the Sebkhah; and a disturbance in the functioning of the water ecosystem of the Sebkhah due to poor drainage and an influx of polluted water.

The catchment area of this lake offers affordable land opportunities, and is very attractive to low-income populations. As a result, the area is experiencing rapid and largely uncontrolled urbanization. This has led to various environmental problems, including degradation of the lake's water quality, flooding, and loss of good agricultural land. If the rate and trend of growth continues, the Sejourmi Lake area will shortly become an integral part of the city of Tunis. Unless a clear development strategy is defined, the consequences of this growth on the city of Tunis will be severe. The participatory process offered brings together all those who have a stake in the future of the Sejourmi Lake area and of the Tunisian capital city, so that development options can be agreed and implemented.

In 1995, an environmental profile of the catchment area of Sejourmi Lake was prepared. To launch the participatory process, a consultation based on the information collected was organized. This brought together over a hundred people from the public, private and community sectors. It was the first opportunity these actors had to meet and discuss the issues associated with Sejourmi Lake. Two priority issues were discussed, water management and land management. The institutional set up for managing the area was reviewed and the mechanisms to improve it were agreed upon. The consultation reconfirmed the strong interest of a wide range of actors and politicians. The Ministers for the Environment and the Mayor of Tunis, through their interventions during the consultation, called for the mobilization of all those who could contribute to the preparation and implementation of a concerted development strategy for the area. The challenge now facing the project is the facilitation of the process of negotiating the future of Sejourmi Lake, in the knowledge that this will play a major role in the future of the capital city. The priority issues include: the degradation of the Lake, the loss of farming land, poor drainage, flooding and health hazards, uncontrolled urban growth, integrated urban management of the Sidi Hassine neighborhood. The presentation of action plans and the establishment of financing mechanisms was scheduled for May 2000.

The project is supported by the United Nations Center for Human Settlements (Habitat) and the United Nations Development Programme (UNDP). Other partners include the French and Tunisian Governments. The project is implemented by the Municipality of Tunis with the following local partners: Ministries of the Environment, Public Works, Agriculture, Social Affairs, and Professional Training and Employment; and with the following agencies: ONAS (sewage), ANPE (environment), SONED (water supply), STEG (electricity and gas), AFH (urban land), AFI (industrial land); and with the unions UNAP (agriculture and fishing) and UTICA (industry and trade).

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