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WORLD MARITIME UNIVERSITY
Malmö, Sweden

**OVERVIEW OF TUNISIA'S MARINE
ENVIRONMENT IN SUPPORT OF
ADMINISTRATIVE POLICIES AND
PROGRAMMES**

By

DEROUICHE Fredj

Tunisia

A dissertation submitted to the World Maritime University in
fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

in

**GENERAL MARITIME ADMINISTRATION
&
ENVIRONMENT PROTECTION**

1997

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the university.

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ABSTRACT

Title of Dissertation: **Overview of Tunisia's Marine Environment in Support of Administrative Policies and Programmes**

Degree: **MSc**

The dissertation is a real investigation in the marine environment field, which few people are familiar with, although it concerns everybody. The investigation being carried out in three steps; each step covering one aspect of the marine environment, and the result is given in the conclusion .

As a first step, the main problems affecting the marine environment in Tunisia, are identified and analysed. An attempt is made to identify the impact of such problems on the marine environment, human health and the national economy.

In the second part, the institutional framework, dealing with the marine environment, is presented and analysed. The role of the different organisations is identified showing the mains strengths and weaknesses of the network. In the same part, the legal framework is also studied. The national environmental legislation is analysed in the context of pollution prevention, waste management and resources management. The international legislation is analysed focusing on the involvement of Tunisia in the global and regional marine environmental treaties, and the implications of the implementation of such treaties on the administration and the national economy.

The third part covers the different approaches adopted in dealing with marine pollution. Public awareness, financial incentives, management of municipal and industrial wastes in the coastal zone and the response strategy are all discussed in this part. The deficiencies of the different approaches and strategies are also highlighted.

The conclusion is a summary of all the findings and results of the study. It contains also some recommendations for the improvement of some actions and a review of others.

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LIST OF ABBREVIATIONS

BOD	Biological Oxygen Demand
CLC 1969	International Convention on Civil Liability for Oil Pollution Damage (1969)
COD	Chemical Oxygen Demand
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
FODEP	Clean-up Fund (Fond de Depollution)
GEF	Global Environmental Facility
GCC	General Command Centre
ICC	Inland Command Centre
LC 72	Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, 1972 (London Convention)
LL 66	Load line Convention, 1966
MARPOL 73/78	International Convention for the prevention of Pollution from Ships 1973, as modified by Protocol of 1978
MEPC	Marine Environment Protection Committee (IMO)
MNAPC	Maritime Navigation Administrative Police Code
NEPA	National Environment Protection Agency
NCSD	National Commission on Sustainable Development
NGO	Non-Governmental Organisation
OCC	Offshore Command Centre
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990
ONAS	National Sanitary Agency

REMPEC	Regional Marine Pollution Emergency Response Centre (Malta)
SFV	International Convention on the Safety of Fishing Vessels,1977
SOLAS 74	International Convention on the Safety of Life At Sea,1974
STCW 78	International Convention on Standards of Training, Certification and Watchkeeping for seafarers, 1978
UNCED	United Nations Conference on Environment and Development, 1992
UNCLOS	United Nations Convention on the Law Of the Sea, 1982
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation

INTRODUCTION

There is no doubt that the 20th century is the most important in the history of the human race and the environment. Most of the big events have taken place during this century, the major scientific inventions, wars and crises. The 20th century has been marked by a long period of industrial growth and massive environmental destruction, but during the last quarter of the century there has been period of global environmental awareness.

The year 1972 is memorable in the history of the environment, because for the first time States came together and agreed unanimously about the principal of protecting the environment and preserving the right of the future generations to a clean environment. The Stockholm Convention on Human Environment was an historic environmental achievement followed later by many other global and regional agreements dealing with some specific aspects of the environment.

The second memorable year is 1992, the year in which the international community, more than ever, became committed to protect the environment against the new threats; they met this time in Rio de Janeiro and expressed their determination to save the Earth by adopting several legal instruments and principals dealing with climate change, biological diversity, and the management and conservation of forests. Agenda 21 and the Rio Declaration, together with the establishment of the United Nations Commission on Sustainable Development, were the main products of the United Nations Conference on Environment and Development (UNCED). Chapter 17 of Agenda 21 reflected the importance of the marine environmental issues in the considerations of the conference. For the first time the concept of linking development to the environment received global commitment, putting an end to the idea that a protected environment is a luxury in developing countries. All states are required to balance their needs for development with the protection of the environment.

Tunisia was one of the developing countries that committed itself to the principles of the Stockholm and Rio conferences, despite the multitude of constraints faced. Tunisia has decided, since the late 1980s, to put end to many decades of carelessness and to adopt an environmental policy that goes hand-in-hand with its development policy.

The concerns of Tunisia about the environment in general, and the marine environment in particular, are well justified. In fact, Tunisia has many marine interests that need to be protected. The sea has always been vital for the Tunisian population. Going back to the early Phoenician and Roman civilisations, maritime transportation and fisheries were well developed along the east coast. This was reflected in the development of many old cities and ports along that coast. Now, with most of the population and the activities concentrated in coastal areas, the sea becomes more economically and socially important. The two main components of the national economy, fisheries and tourism, are fully dependent on the sea and extremely sensitive to any marine environmental changes.

The fishing sector provides 100,000 jobs and the equivalent of 76 million dinars of foreign currency in addition to its contribution to national food security. This gives the sea a major economic and social role in a country suffering from the dilemma of unemployment.

Tourism, the other corner stone of the national economy, is totally dependent on the sea. The Mediterranean's moderate climate and the natural features of the coastline, make Tunisia an attraction for millions of European tourists and foreign investors.

Most of the 1,300 km of Tunisia's coastline are vulnerable to marine pollution. The East coast, consisting mainly of three gulfs (Tunis, Hammamet and Gabes), has shallow waters, low tides and slow currents. It has most of the islands (Jerba, Kerkennah, Zembra), lakes and lagoons (Ghar Elmelh, Tunis, Boughrara). The north coast is for the most part rocky with deep water. The north coast is naturally

preserved from human activities, except in the region of Bizerte and Tabarka where industrial and tourism activities are increasingly being developed.

The protection of the marine environment is the responsibility of everybody regardless of one's role or position in the society. Politicians or decision-makers cannot be successful in their policies and decisions unless the rest of the people take part in the process and understand the underlying aims and objectives. The administrators, directly or indirectly involved in the implementation of the environmental policy must have a clear view of all aspects of such a policy. The general public also needs to have an understanding of the overall situation and the mechanisms that need to be employed to deal with the protection of the marine environment. This is indeed required in order for individuals to understand their role and responsibilities. At the same time these individuals also have the right to be honestly and continuously informed about the personal implications of the linkage of environmental and development issues.

This investigation is an attempt to draw a picture in three dimensions of the marine environment, by identifying the main environmental problems and threats, analysing institutional and legal structures dealing with the marine environment, and studying the different actions and measures taken or being taken, to combat the different types of marine pollution or threats within Tunisia. The result of the investigation should be useful for those who need to quickly comprehend the full breadth of marine environmental issues in Tunisia today. It provides a starting point for those who are interested in carrying out further research on a specific subject related to the marine environment. Decision-makers and other people involved in making or implementing the national environmental policy can find in this investigation some ideas and remarks about what has been decided and done in the past concerning the marine environment. It also provides some ideas and recommendations on what can or should be done in the future. After 10 years, the national environmental policy needs to be evaluated to ascertain whether it is keeping Tunisia on the path towards sustainable development.

CHAPTER I

DIFFERENT SOURCES OF MARINE POLLUTION AND THEIR IMPACT ON THE MARINE ENVIRONMENT

1.1 URBAN SOURCES

1.1.1 Urbanisation in the coastal zone

When Tunisia became independent in 1956, the population was about 3.8 million, most of which was living in rural areas. Today, this population is over 8 millions, with a growth rate of 1.7% and is expected to reach 10 million by the year 2000.¹

The social and economic changes experienced in the country during the last 40 years have resulted in a rural exodus towards the coastal cities which are more developed and more industrialised. Today 67% of the whole population is living in the coastal zone, mainly in the five biggest cities.²

Tunis: 1 600 000

Sfax : 510 000

Sousse: 186 000

Gabes : 140 000

Bizerte: 130 000

The tourist industry, based on the natural resources of the sea, is concentrated in the coastal zone occupying more than 100 km of the coastline.³ Ninety per cent of the units and ninety-five per cent the total capacity are located here. The 4 million tourists who visit Tunisia every year, spend over 26 million nights in total and are equivalent to a big city of 100,000 people.⁴ This contributes to the pressure exercised by local people on the coastal zone in terms of occupying the wetlands and the disposal of solid and liquid wastes.

1.1.2 Solid wastes

With an average of 213 kg of household wastes produced per capita annually and a total amount of 1.3 million tons per year, Tunisia is reaching the levels of some industrialised countries.⁵ Because 75% of urban population is living in coastal cities, about 1 million tons of household wastes have to be handled in coastal areas.⁶

The rate of production differs from city to city and from season to season, but it is known that greater Tunis and the tourism areas are generating more than other regions, and in summer there are more wastes due to the increase of production and consumption as well.

The major part of household wastes is degradable, food, vegetables and paper represent 75% of the total quantity.⁷ The composition and the proportion of household wastes tends to change due to the change in the economic and social situation of the population. People are relying more and more on packaged products which are easier to carry and to consume; plastic bags are taking the place of the voluminous traditional bags made from palm leaves, glass bottles are being used for water and soft drinks are being replaced by plastic ones. Thousands of domestic products are now sold in either plastic or metallic cans. This trend will make the proportion of plastic, paper and metals increase tremendously and make the problem of household waste management more and more difficult.

Composition of solid wastes	%
Food wastes	60.26
Paper	14.65
Plastic	5.87
Vegetable wastes	5.63
Textile	4.58
Metals	3.36
Toxic wastes	0.03
Hospital wastes	0.17
Others	5.45
Total	100.00

Source: Ministry of Environment (1995)

Municipal wastes in urban areas are managed by the municipal authorities which are responsible for the collection and disposal. They are using several means and much equipment to handle household wastes. However the equipment is in many cases inadequate either by its capacity or by its location. Solid wastes are disposed of in open landfills, 5 to 20 km away from the city.

In coastal cities a big proportion of solid wastes end up in the sea. People living close to the coastline still dump their garbage directly into the sea. The same happens with people invading the beaches in summer time; they do not find a better place for their rubbish than the sea. Although some municipalities are providing garbage containers on the beach, the lack of awareness among the general public makes them useless. Other municipalities have chosen to place their landfill on the beach itself. The city of Bizerte has its landfill on the north side of the canal linking the lake of Bizerte to the open sea. In many other cities wastes are disposed of in the wetlands, in lagoons or in streams where they are carried by storm water to end up in the sea. Although the major part of household wastes is degradable, other toxic and undegradable products could have a serious impact on marine life when the concentration is high or the area is sensitive due to the characteristics of the sea water or the characteristics of marine life.

1.1.3 Liquid wastes (sewage)

The development of urbanisation resulted in a great demand for fresh water. This demand is increasing steadily reaching 230 million m³ in 1995. Consequently, waste water production is increasing and becoming a real problem and threat to the environment.⁸ Sanitation in urban areas has become a priority concern for the national authority. Seventy-five per cent of the urban population is provided with sewage facilities. One hundred thirty-five million m³ of waste water is collected annually.⁹ Seventy-nine of that waste water is directly discharged into the sea while the rest is discharged in some lagoons or streams and carried to the sea by storm water later on.¹⁰ Waste water is heavily loaded with material exerting high biological oxygen demand (BOD) and chemical oxygen demand (COD) as well as other contaminants.

BOD 387 mg /l

COD 935 mg /l

Chlorine 977 mg /l

Phosphorus 13 mg /l

Eutrophication is affecting many areas (lakes, lagoons and bays) and red tides are very often observed in the hot season.

A big number of industries and other activities dealing with toxic products are directly connected to the public sewer, discharging their wastes without any precaution. Gas stations, car washing facilities, clothes dry cleaners, are all using the public sewer for the disposal of their waste water. It must be mentioned that Tunisia is using 22,000 tons of solid detergents and 10,000 tons of liquid detergents per year.¹¹ These detergents are dissolved in waste water and discharged into the sea, affecting the marine life and the national economy. Some regions are seriously damaged. The lake of Bizerte, rich with shellfish and other valuable species, is receiving the waste water of the cities of Bizerte, Menzel Bourguiba, Menzel Abderrahmen, and Menzeljemil. Now, the shellfish are heavily contaminated and have to be treated before consumption. The lake of Tunis is suffering the same problem. The lake of Ishkel, declared in 1980 as a national park, is still receiving the wastes of the small town called Tinja. Several beaches are flooded by waste water through small streams used in many cases as waste disposal.

Waste water is becoming a heavy burden for the authorities, a real threat for the public health and a real enemy of the tourism industry.

1.2 INDUSTRIAL SOURCES

During the last decades many efforts have been made to industrialise the country without any care regarding the environmental impact. The anarchic expansion of industrial activities within, or close to, urban and sensitive areas which has led to the present critical situation. Ten thousand industrial units are spread on an area of 1410 hectares, of which 1257 hectares are located in the coastal zone.¹² 1,200 of these units are considered polluters.¹³

The main industrial activities in Tunisia are food processing, phosphate processing, energy production, textiles and metallurgy.

The main industrial areas are located on the coastline:

Bizerte	60 hectares
Tunis	402 hectares
Nabeul	88 hectares
Sousse	114 hectares
Sfax	117 hectares
Gabes + La Skhira	250 hectares
Mahdia	38 hectares

** Source: Ministry of Environment (1995)*

The industrial activities are increasing very fast claiming more land in the coastal zone, they are expected to spread over 58 hectares in Tunis, 46 hectares in Sfax and 67 hectares in others areas, in next few years.

1.2.1 Food processing industry

This industry, based mainly in the coastal areas, is one of the major polluters of the marine environment. Vegetable and fruit processing industries are generating 55,000 m³ /day of waste water heavily loaded with organic material, discharged in major part directly or indirectly into the sea.¹⁴ Tow thousand olive oil refineries generate 500,000 tons/year of waste water containing 17% of organic material (Margine).¹⁵

Until the last few years, the impact of those discharges was neglected. In 1994, the Ministry of Environment, in co-operation with the German Economic Co-operation Ministry, carried out an investigation on the treatment of the waste water generated by the olive oil refineries in different Mediterranean countries and came to the conclusion that 3 methods can be applied at the national level in order to eliminate the effect of organic material. Such methods have been adopted in some regions since 1995.

1.2.2 Electricity production

Urban and industrial growth has resulted in a tremendous demand for electrical energy, increasing by 6 to 7% annually.¹⁶ Four power plants are generating all together 6,000 GWH per year, the major part being produced by burning natural gas,

5,030 GWH. The rest, 970 GWH, is produced using heavy fuel oil.¹⁷ All the power plants are based on the coastline (La Goulette, Rades, Sousse, Gannouch), for the reason that they need to be supplied by fuel by way of the sea, and to use sea water in their cooling systems. Thermal pollution is one problem of this industry. Water discharged with a temperature of 30 to 35 °C can affect marine organisms in the vicinity of the outfalls by changing the amount of dissolved oxygen and water salinity. Fish eggs, larvae and other marine organisms are sucked up in large quantities with the cooling water, which has an effect on the biomass in the area.

These electricity plants cause serious problem of air pollution by the emission of carbon and sulfur oxides. Toxic gasses are carried to the east by the prevailing wind in the region and fall as acid rain into the sea.

The main threat to the marine environment this industry is bringing, is the quantity of heavy fuel oil (550,000 tons / year) transported by sea to the plants and stored in the coastal zone very close to the shore line in huge tanks (Sousse 35,000 tons, Gabes 17,000 tons, Goulette-Rades 340,000 tons).¹⁸ In addition to the risk of ship accidents and operational accidents, those tanks present a substantial risk of fire and spills which can have a disastrous impact on marine life in general and the national economy in particular through the damage to the fishing and tourism industries. One example is the power plant of Sidi Abdelhamid located between two of the biggest tourism areas in the country (Sousse and Monastir).

1.2.3 Phosphate processing

Following a large period of exporting raw phosphate, Tunisia undertook to process phosphate ore and to exploit it more profitably by creating a domestic industry for phosphoric acid and fertiliser production. The country's first triple superphosphate plant entered into production in Sfax in 1952. The sector expanded considerably during the 1970s and a second industrial site was created in Gabes. In 1988, an other plant was established in La Skhira. All these plants are located in the coastal zone in the vicinity of port facilities in order to facilitate the exportation of the product.

The chemical plant of La Skhira has a production capacity of 330,000 tons per year.¹⁹

1,100 tons /day of phosphoric acid 28%

1,200 tons /day of phosphoric acid 54%

700 tons /day of superphosphoric acid 72%

The sulfuric acid (H_2SO_4) required for the phosphoric acid production is manufactured in the same plant at the rate of 1750 tons /day.

The chemical plant of Gabes has:²⁰

-3 units for the production of phosphoric acid 28% with a total production capacity of 400,000 tons /year.

-2 units for the production of phosphoric acid 54% with a total production capacity of 280,000 tons /year.

-6 units for the production of the sulfuric acid required to produce phosphoric acid with a total production capacity of 8,400 tons /day.

The same plant is producing 300,000 tons of ammonium nitrate per year, 80,000 tons of dicalcium phosphate (DCP) per year and 1,200 tons of diammonium phosphate (DAP) per day.

The chemical plant based in Sfax produces:²¹

1,000 tons /day of triple superphosphate.

360 tons /day of phosphoric acid 28%.

1,100 tons /day of sulfuric acid.

The environmental problems associated with these industries are mainly air and marine pollution. This industry is responsible for the emission into the air of 3,800 Kg /hour of sulfur dioxide and 600 Kg /hour of ammonia.²² Each ton of phosphoric acid produced is associated with the emission of 600 g of fluorine elements. In addition to the harm caused to the workers and the population's health, those toxic gases are responsible for acid rain affecting the vegetation and the sea water of the area.

The second and major environmental problem resulting from this industry is the discharge of phosphogypsum directly into the sea. Chemical plants are discharging all together about 12,000 tons per day of dry phosphogypsum, which is a by-product of phosphoric acid containing a large number of pollutants such as fluoride and heavy metals, in areas in most cases protected from currents by port infrastructures.²³ The

impact of the discharge of this product without care over more than 20 years has resulted in serious environmental damage and economic loss.

The Gulf of Gabes, which is the main source of fish in Tunisia providing about 50% of the total catches, is heavily affected.²⁴ The production has decreased tremendously from 1994 to 1995, when it dropped by 20.5%.²⁵ In addition to the over fishing, many studies show that industrial pollution is mainly responsible for this drop. A collapse of the eco-system was observed around the discharge point, where the turbidity of water is very high. The regression of the *Posidonia* fields resulted in a decrease in light penetration.

1.2.4 Oil refining

The single oil refinery in Tunisia is located in the north of the country, away from the production area. Built in the early 1960s with a production capacity of 1.5 million tons per year, it constitutes the main supplier for the local market in oil products. Crude oil is transported from the production areas (La Skhira, Ashtart, Tazarka) to the refinery by tanker ships. The refinery is located within the urban area of the city of Bizerte, close to the port facilities, which makes it a potential danger for the population surrounding, for the port activities and for the marine environment. The danger comes first from the risk of explosion and fire, second from the risk of major pollution and third from chronic air and marine pollution.

NO_x and SO_x gases are emitted in large quantities into the air and carried by wind towards the urban area and the sea. This has a negative affect on human health in the long run. The second source of chronic pollution is the water discharged into the sea in an area relatively protected from the currents. Cooling water, processing water and ship ballast water are discharged in the same flow at the rate of 2000 m³/ h.²⁶ This water, having a temperature of 30 to 35 °C, can have an impact on marine life especially in the hot season, but this can be negligible when we consider what this water contains of oil, acids, sediments and heavy metals (the refinery is using 300 tons of soda and 360 tons of sulfuric acid in the production process).²⁷ Settlement is used as a separation process for ballast water, processing water being diluted in cooling water to the proportion of 1 to 3. The lack of continuous monitoring of the

discharge makes this method of treatment unreliable and represents evidence of marine pollution in the vicinity of the water outfall.

The refinery has a storage capacity of 230,000 m³ crude oil and 41,000 m³ oil products. Huge tanks are installed around the refinery, some of them having a capacity of 10,000 m³.²⁸ Some tanks are located only a few meters from the shoreline. A rupture of a single tank can result in a disaster, the spill can flood the urban area and easily reach the sea. Studies were carried out to extend the refinery to double its production capacity, consequently the environmental impact will be greater and much worse.

1.2.5 Metallurgy industry

One of the sources of pollution suffered at the lake of Bizerte and the area around, is the steel production activities. Located on the South-west side of the lake, a few kms away from the city of Menzel Bourguiba, the steel factory "Elfouledh" is responsible for air pollution by the emission of 9 tons /day of dust, containing ferrous oxide and carbon monoxide.²⁹ A red cloud is always present over the factory and is carried by the southern winds towards the urban area of Menzel Bourguiba city. The same factory causes serious pollution to the lake through the discharge of waste water. Ecological studies show the presence of copper, cadmium, chrome, mercury, zinc, iron, lead and uranium in the sediments, water and living resources.³⁰ The highest zinc, lead, copper, chrome and uranium contents were found in the sediments while low levels of cadmium and mercury were found in the flesh of fish and in the lake's grasses. The change in the PH and temperature of the water in the vicinity of the discharge point affects the ecological balance and causes considerable deaths among marine organisms.

1.2.6 Tanning industry

The leather industry is growing rapidly and becoming a real environmental concern because of the amount of pollutants it generates. About 30 tanneries, most of them located on the coastline, are discharging 2500 m³ /day of waste water containing chromium, sulfides, cyanides and suspended material (100 mg /l of chromium, 3,000

mg/l of COD, 25,000 mg /l of BOD₅).³¹ The major part of this waste water is going directly or indirectly to the sea affecting the living resources.

1.2.7 Other small industries

These are contributing to the pollution of the marine environment since they are generally located in a disorganised fashion in the coastal zone and are not equipped to treat their wastes. The main areas affected are the southern lake of Tunis, where there are about 700 factories discharging 40,000 m³ of untreated waste water in the lake, and the industrial zone of Bizerte, where there are more than 100 factories discharging their waste water (some of which is highly polluted) directly or indirectly into the lake.³²

1.3 OFFSHORE ACTIVITIES

Tunisia, unfortunately, has limited oil and gas resources inland. With the increase in the consumption of energy and the drop in oil production of the main inland fields, it has had to search for other alternatives. A vast offshore exploration activity in co-operation with foreign oil companies started in the early 1970s. 17 permits were granted (until 1994) covering 46,154 km² spread over almost all the whole eastern continental shelf.³³ In 1994, offshore seismic exploration covered 2,775 km and 4 wells were drilled.³⁴

Ashtart, the first offshore oil field to enter into production in 1974, with 1 million tons/year, is providing 20 % of the total national production.³⁵ Tazarka and Cercina, two other offshore oil fields, are producing together 200,000 tons/year.³⁶ Miskar, a natural gas offshore field, entered into production in 1995, with a capacity of 1 billion m³/year.³⁷

The offshore oil and gas industry is associated with four main activities: exploration, drilling, production and transportation. Each of these activities has an impact on the marine environment.

1.3.1 Impact of exploration phase

The effect of exploration activity is considered minimal depending on the exploration techniques. The release into the sea water of a considerable amount of energy and the use of explosives or air-guns to create sound-signal may injure or kill fish and disturb other species. Survey vessels towing long floating cables with attached equipment may create potential conflicts with fishing vessels in the area.

1.3.2 Impact of drilling phase

Drilling activity has a more serious impact on the marine environment. The physical disturbance to the seabed starts with the installation of the drilling rig, then comes the problem of the cutting material discharged around the drilling area. Drilling cutting affects the water column increasing the water turbidity and reducing the light penetration. There is an affect also on the sediments in the surrounding area. Another pollutant to sea water is the mud used during the drilling operation to lubricate the drilling string in movement and to maintain the pressure needed to prevent the escape of oil or gas from the well. This mud is a mixture of water and other chemicals including oil. It can affect the marine organisms in the vicinity when released into the sea water in high concentration. Well blow-out and oil spill is the major risk associated with drilling activity. Its affect can be disastrous on the marine environment and the people working on the rig.

1.3.3 Impact of production phase

The product coming out from the well is always a mixture of oil and water. The concentration varies from well to well, but the quantity of water is in all cases considerable. After separation, the production water is discharged into the sea at the site of production. This water contains, in the best cases, 40 ppm of oil, which is considered high compared with the discharge criteria provided for ships in MARPOL 73/78. The problem is worse, because the discharge is done in a fixed point and within a special area. This chronic pollution has a serious impact on the marine environment, especially, when the discharge is not monitored rigorously.

The input of oil in the sea water has many origins, it comes from a leakage of the wellhead, or from a leakage of the piping system. Oil spills can occur during the processing or loading operations, but the major threat remains in a blowout accident, where huge amounts of oil can be spilled and are difficult to stop.

1.3.4 Impact of transportation phase

Normally, production platforms do not have a big storage capacity, so oil has to be transported somewhere else. Oil or gas is transported by pipelines or shipped in tankers. Both means represent a risk for the marine environment. Submarine pipelines are subject to corrosion or accidents caused by other activities such as the shipping or fishing industries. Transportation by ship has the usual risks of collision, grounding and operational accidents.

1.3.5 Main resources at risk

The fishing industry is the first sector to be affected by the offshore activities. The Gulf of Gabes, the main fishing area, and the Gulf of Hammamet host the main offshore activities. They suffer chronic pollution generated by the exploration, drilling and production phases and remain threatened by a possible accident.

The tourist industry, well developed on the eastern coast of the country, is under a permanent threat of a major spill resulting from an offshore accident. The oil field of Tazarka located in the Gulf of Hammamet, is only 30 miles from the main tourist area (Hammamet-Nabeul) and 50 miles from the second tourist area (Sousse-Monastir). The third corner stone of the tourist industry in the country is the island of Djerba, which is located in the south-east of the Gulf of Gabes, 40 miles from the oil field of Ashtart. The new oil field of Cercina located a few miles from Kerkenna islands represents a potential threat to the population there, relying mainly on tourist and fishing activities.

Among other kinds of pollutants introduced into the sea water by the offshore activities, can be mentioned the sewage and garbage generated by offshore units and disposed of, in most cases, into the sea. Another problem, which seems too early to

think about, but which has to be taken into account, is the final destiny of the production platforms. They could be an environmental problem if the option is to sink them later on.

1.4 FISHING INDUSTRY

The fishing industry is a vital sector in the national economy. It is one major source of foreign currency (76 million TD in 1995), providing a substantial number of jobs in addition to food security.³⁸ This industry has been developing rapidly and in an uncontrolled manner during the last two decades, which has resulted in a depletion of the marine resources.

The marine environment is affected by four different activities: ports construction, ports operations, fishing practices and wastes discharges.

1.4.1 Port construction

As a result of the development of the industry and the growth of the fleet in number and size, new ports have to be built and old ports have to be expanded. Large areas were claimed from the sea and filled with stones, concrete and soil to build breakwaters and jetties. Channels were dredged to allow bigger ships to enter certain ports. Dredging became day-to-day work in some ports. Dredging material is disposed of into the sea, in shallow waters, affecting the benthic communities of large areas.

The construction of some ports resulted in an erosion of the coastline in the vicinity due to the changes in direction of currents. This resulted also in a change in water quality in some protected areas due to the decrease of the water exchange with the open sea (the case the Ghar Elmelh lake).

1.4.2 Port operations

Port operations include all conservation and commercialisation of fish within the port area. It also includes bunkering, shipbuilding, dry-docking and repair activities which generate a lot of solid and liquid wastes, discharged directly or indirectly into the sea. The environmental problem is serious since all fishing ports and shipyards lack the facilities to deal with sewage, storm water, oil residues and all kinds of solid wastes. In addition, most of them are not covered by the municipal services.

1.4.3 Fishing practices

Until a few years ago, the fishing industry had been using the old artisanal fishing practices. In the late 1970s, this industry boomed with the introduction of new equipment, new techniques and the arrival of foreign fishermen (Italians). A lot of mistakes were made with regard to the use of living resources. One example is the destruction of the coral reef by using the trawling techniques in the northern national waters. The use of improper nets and the excessive number of trawlers operating in certain sensitive areas resulted in a depletion in the fish stock. The Gulf of Tunis and the Gulf of Gabes are the most affected. The newly adopted aqua-culture techniques have also contributed to the organic pollution of the marine environment by the input of nutrients, causing eutrophication, massive algal blooms and severe depletion of dissolved oxygen, manifested by the mass killing fish.³⁹ The lagoon of Boughrara, the main area of aqua-culture, located in the south-east of the country, suffered heavily from this phenomena during the summer of 1991.⁴⁰ All the studies carried out, either by the university of sciences or by the National Oceanographic and Fisheries Institute, have shown that the mass death of fish in the different aqua-culture basins in that area is due to asphyxiation resulting from the excess of nutrients in the vicinity of the basins.

The use of explosives was a fishing practice in the past. It is still used in some areas even though it is banned. In the last few years, explosives were used by fishermen to frighten away Dolphins which became a real threat to their equipment and their catches. The impact of explosives may have serious effects, especially on the migratory species.

1.4.4 Vessel generated wastes

The fishing fleet used in different fishing modes is about 14,000 units.⁴¹ More than 5,000 vessels are mechanically propelled; 500 vessels exceed 20m in length and are equipped with diesel engines of 400 HP and more.⁴² The maritime population is about 60,000, most of whom are working in the coastal waters, while more than 5,000 people are engaged on the high sea.⁴³

This considerable fleet is one source of marine pollution which is always underestimated and sometimes ignored. Tons of oil are discharged everyday in the port area and in the coastal waters. No single vessel is equipped with an oil-water separator or with storage capacity for oily wastes. No single vessel is equipped with treatment or storage capacity for sewage. No single fishing port is equipped with reception facilities for sewage or oily wastes.

Considering the bunkering capacity of the motorised vessels, ranging from 200 litres for a small vessel to 40 tons and even more for bigger vessels, it can be assumed that 10,000 tons of oil is continuously navigating the coastal waters which is equivalent to the national cabotage traffic of oil. There is no risk of a major spill, but being most of time close to the coastline, these fishing vessels represent a permanent threat to the environment.

Solid waste dumping into the sea is practiced daily. Among the 60,000 fishermen, 25% can be considered living offshore, which is equivalent to a big town of 15,000 people or 5 large cruise ships. Assuming that people offshore generate 50% less solid wastes than onshore (106,5 Kg/year), we find that about 1,600 tons of garbage are thrown overboard. The problem offshore is worse because the major part of these wastes is undegradable (metallic and plastic packaging). Another extremely toxic pollutant, frequently disposed of into the sea, is paint cans and electric batteries. Hundreds, if not thousands of old batteries, with all the lead and acids they contain, are dumped into the sea. Their impact is completely ignored by the fishermen.

Plastic nets and ropes are dumped deliberately or accidentally into the sea to become a trap for turtles and other fish.

1.5 MARITIME TRANSPORTATION

In the general public opinion, maritime transportation is the major polluter of the marine environment. The picture given by the media is always dark, ships on fire, oil spilled on sea surface and on beaches, dead birds and sea animals. But the reality is different, maritime transportation contributes to oil input into the sea water by only

12%. The shipping industry is bound by the largest and most world-wide accepted number of international safety and environmental conventions and treaties.

In the maritime transport chain, pollutants are introduced into the marine environment in three different ways: port activities, ship operations and ship accidents. Shipbuilding is not well developed in Tunisia, so its contribution to marine pollution is minimal. The only shipyard, located in Menzel Bourguiba, is working as a dry-docking and repair yard. This shipyard is affecting the sensitive lake of Bizerte by the input of sediments, painting products and oil.

1.5.1 Port activities

The disruption of the marine environment starts with the construction of the port. The affect is the same as in the case of fishing ports but on a larger scale. Hopefully, the construction or the expansion of commercial ports is less frequent (only two ports built in the last 20 years). But the problem of dredging is very common. Dredging is regularly done in most ports to maintain or to increase the operational channel depth.

In 1996 the port authority started a large dredging operation in three different ports:⁴⁵

- Port of Zarzis: Both the channel and the main basin are being dredged. 1,800,000 m³ of dredged material has to be disposed of at sea and spread over an area of 6.25 km², located 8 km from the port, at a depth of 8 to 9 m.
- Port of Goulette-Rades: 300,000 m³ of dredged material coming from Goulette port has to be disposed of at sea, at a depth of 10 m, 5 km away from the port and spread over an area of 2 km². Dredged material coming from the oil terminal of Rades port (50,000 m³) is discharged on shore, 400 m from the dredged area.
- Port of Bizerte- Menzel Bourguiba: 50,000 m³ of dredged material extracted from the port of Menzel bourguiba (southern berth) is disposed of on land, 300 m from the coastline. At the same site, another 50,000 m³ coming from the oil terminal of Bizerte is dumped. They are transported by barges from the dredged area to the dumping site.

It must be mentioned here that for the first time the dredged material has to be disposed of on shore and treated. The environmental impact assessment showed that

the dredged material from both oil terminals and from the port handling coal ore, is toxic to the marine environment. In the other cases the impact was considered minimal and dumping at sea was authorised under the conditions shown above.

This approach seems to be a compromise rather than fully based on environmental considerations, because the dumping sites are not appropriate for such quantities of material. A water column of 8 or 10 m is not enough to absorb such a quantity as a thick layer of sediments will be formed on the seabed affecting all benthic organisms.

During the commercial operations, ports generate a lot of wastes and a substantial part ends up in the sea. Liquid bulk cargo handling is always associated with leakage, overflows and other small cases of mishandling causing the discharge of oil and other toxic substances to flow into the sea water. Dry bulk handling is responsible for an inevitable discharge into the port basin of all kinds of dry cargo, which results in the accumulation of contaminated sediments which are important when the port must be dredged to maintain operational draft.

All Tunisian ports are suffering from the same problem since they are all involved in handling liquid and dry bulk cargo.

	Crude oil	Products	Chemicals	Dry bulk
Bizerte-Menzel	X	X		X
Tunis		X	X	X
Goulette				
Rades		X	X	X
Sousse		X		
Sfax		X		X
La skhira	X	X	X	
Gabes		X	X	X
Zarzis	X			

The main chemicals in bulk handled in the national ports in 1995 were:⁴⁶

Phosphoric acid (Gabes, La skhira)	1,165,346 tons
Sulfuric acid (Gabes, Tunis)	55,371 tons
Ammonia (Gabes)	279,225 tons
Liquid sulfur (Gabes)	102,465 tons
Soda (Rades, Gabes)	36,061 tons
Other chemicals (Tunis, Rades)	52,921 tons

Dry bulk cargoes handled in different ports during 1995 and considered to contribute to marine pollution are as follows:⁴⁷

Chemical fertilizer (Gabes, Sfax)	1,478,459 tons
Raw phosphate (Rades, Sfax)	1,385,919 tons
Sulfur (Sfax, Gabes)	1,335,033 tons
Cement (Bizerte, Rades, Gabes)	1,051,888 tons

Iron (77,278 tons), aluminum (44,041 tons), lead (9,936 tons) are shared by two ports, Tunis and Rades and 5,564,458 tons of crude oil were handled at three oil terminals (Bizerte, La skhira, Zarzis).

Except for the port of Zarzis and Goulette, all Tunisian ports have to deal with the 4,042,845 tons of oil products including the 1,524,190 tons of heavy fuel oil.

The port areas have huge storage capacity for Chemicals and oil.

1.5.2 Ship operation sources

In their normal operations, ships generate a variety of wastes which have been discharged at sea without control for many years. Despite the different conventions and agreements banning the deliberate discharge of such wastes in some special areas, many ships continue to do so in absence of an enforcement mechanism. Tunisian waters are seriously touched by this problem because of the growth and the type of shipping traffic in the areas.

Ship wastes can be divided into four main categories, as was done in MARPOL 73/78, assuming that the affect of air pollution caused by ships on sea water is small enough to be neglected at present. Oil, noxious substances, sewage and garbage are the major pollutants generated during the normal use of a ship. Here, ballast water should be included in the list of ship wastes because it is becoming a concern in many

regions in the world, because it is discussed within IMO and a possible new annex to MARPOL 73/78 regulating the exchange of ballast water in deep sea is under draft now by the MEPC. Water ballast is responsible for the transfer of some marine organisms and pathogens from one area to another. These marine organisms are in many cases able to grow very fast in their new environment and affect the local marine life. Fresh water and enclosed areas are most affected by this phenomena. The transfer of hazardous material is not excluded when ballast water is taken from a highly contaminated area.

Some of the Tunisian waters are extremely vulnerable to this kind of pollution. The lake of Bizerte is one example. About 100,000 tons of ballast water is discharged annually in the bay of Sebra by the vessels loading cement. The lake, having a low water exchange with the open sea, can be seriously affected. The second area under threat is the area around the port of Zarzis which accommodates the main aqua-culture sites. The area has a poor water exchange and relatively shallow waters. Water ballast (about 50,000 tons/year) is discharged there by the tanker ships calling at the oil terminal of Zarzis.

Operational oil pollution represents 40% of the whole oil input caused by ships into the sea. This keeps decreasing with the implementation of the provisions of MARPOL 73/78. The Mediterranean Sea is adopted as a special area where no discharge from the cargo spaces is allowed, but the lack of reception facilities for oily ballast residues at many oil terminals, combined with lack of awareness, makes some officers on board tanker ships violate that provision and deliberately discharge ballast water mixed with oil into the sea, sometimes close to the shore.

Ships fitted with an oil-water separator are allowed to discharge waste water from their machinery spaces with a concentration of less than 15 ppm, but this condition is unfortunately in most cases violated unconsciously by the crew or substandard ships. More than 6,000 ships call at Tunisian ports annually.⁴⁸ About 450 are oil tankers.⁴⁹ This shows how serious the problem is, especially when we know that reception facilities for oily wastes are not available in all national ports.

The importance of the chemical industry in port operations has previously been discussed. What must be mentioned here is that none of the four ports handling bulk chemicals provides reception facilities for the 400 or more chemical tankers calling at those ports. The main product dealt with is phosphoric acid classified in category D of the list of noxious substances (MARPOL annex II). It has less restrictions as regards its discharge at sea. Sulfuric acid and ammonia are categorised C with more restrictions regarding discharge at sea.

Substance	UN number	Category	Quantity	Exp./Imp
Phosphoric Acid	1805	D		Exp.
Sulfuric Acid	1830	C		Imp
Ammonia	2672	C		Imp

The impact of the discharge of this contaminated ballast water and tank washing water on marine life cannot be quantified but there is no doubt that the Gulf of Gabes is highly affected by the accumulating effect of more than two decades of continuous discharge of those chemicals in an area which is ecologically very sensitive (shallow waters rich with marine species).

The problem of sewage generated by ship crews seems to be exaggerated if one only considers the wastes generated by the crew, but the real problems come from the passenger and cruise ships and from those carrying animals. These ships are concentrated on specific routes and ports which make the effects more serious. In Tunisia, passenger and cruise traffic is concentrated on the port of La Goulette (95%). In 1995, The number of passengers and cruising people who entered Tunisian ports were respectively 280,000 (386 ships) and 88,348 (159 ships).⁵⁰ This will have a negative impact on the marine environment if all these ships discharge their sewage in the port area or close to the coastline, eutrophication and the introduction of pathogens being the main results of that discharge. The situation is not so bad because most passenger and cruise ships comply with the requirements of annex IV of MARPOL 73/78 in terms of sewage disinfecting and discharge conditions.

The same thing applies to solid wastes; in terms of quantity, the garbage generated by a ship's crew is negligible compared with what passengers generate. When one considers the definition of garbage in Annex V of MARPOL 73/78, then the problem of cargo ships appears to be serious, because all the solid wastes generated during the normal operations of the ship are considered garbage. The fact that some of the solid wastes are not degradable in sea water (plastic and metallic products) make the problem more serious. Despite what was set up in the Annex V of MARPOL, the Tunisian waters still suffer the deliberate dumping of garbage by ships calling in Tunisian ports or those passing near the coast. Considering the prevailing wind and currents, Tunisian coasts are highly vulnerable to floating objects. Besides the accidents caused to small fishing boats (damage to the hull and engine) and the degrading of the appearance of beaches, some types of disposed garbage are highly toxic to marine life such as medicines, paints and batteries.

1.5.3 Accidental pollution from ships

The record of accidental pollution is relatively good; in the last 20 years only a dozen accidents have occurred in national waters; one was a collision, two involved fires and the rest were groundings. The pollution resulting from these accidents was minimal because most accidents involved general cargo ships. The north coast was involved in most of these accidents due to the weather and conditions. The number of groundings decreased after the acquisition (in 1986) by the port authority of two powerful tugboats; these enhanced the salvage capabilities in the region. The quantity of bunker oil released at sea during these accidents is unknown but it is estimated to be only a few hundred tons. Many ship wrecks are still lying on the beaches of some sensitive areas affecting the tourism industry (Errimel-Bizerte).

The main accident recorded was the one happening on 9 February 1992 involving the tankship M/V BLUE when unloading fuel oil at the port of Rades. The rupture of the unloading pipe caused a discharge to flow into the sea of more than 50 tons of fuel oil, affecting the port area and 10 km² in the open sea (Gulf of Tunis).⁵¹

Fortunately, the national waters have been saved from major oil spills or hazardous material accidents, but the risk remains very high. One and a half million tons of oil are moved annually by national cabotage, which means that 10,000 tons of oil are permanently moving in coastal waters.⁵² One hundred fifty million tons of oil pass by the strait of Sicily every year; an average of 4 to 5 loaded oil tankers per day pass by the lanes of Cap Bon, only a few miles from the Tunisian coastline. This shows the gravity of the situation and size of the risk the national waters are facing.⁵³

The Mediterranean Sea has the highest average in terms of amount of oil present as ship cargo at any time, and the amount of oil lost per year due to ships sinking. Since pollution has no boundaries, oil must be frequently carried by currents to Tunisian waters. The M/T Heaven which sank in 1991 near the south coast of Italy with 140,000 tons of crude oil, may have affected Tunisian waters more than it was thought in the absence of specific water quality monitoring.

1.6 AGRICULTURAL SOURCES

It is hard to believe that agriculture activities are contributing to the degradation of the marine environment, but the reality is that agriculture is responsible for chemical and physical pollution to the sea water through storm water runoff. Nutrients, pesticides and herbicides are the main pollutants introduced into the sea water. Out of the 16.5 million hectares (total area of the country), 5 million hectares are farmed with all kinds of crops. In order to increase efficiency and achieve food security, national agriculture has to use new farming techniques based on irrigation and the use of chemical fertilisers, pesticides and herbicides. The doses are in most cases above the standard.

During the season 1992-1993, the quantity of fertilisers used for agriculture purposes was :⁵⁴

Ammonium-nitrate	244,650 tons
Super-phosphate	68,500 tons
Di-ammonium phosphate	40,000 tons

During the same season, about 455,000 hectares were treated with chemical herbicides.⁵⁵

Having the major part of its soil arid, Tunisia has opted for the irrigation alternative. 18 dams exist on the major rivers in addition to more than 200 small hillside dams and 1,000 hillside lakes collecting 2.7 billion m³ of rain water per year.⁵⁶ This has resulted in a decrease of surface water flowing to the sea and consequently a decrease in the input of sediments which have affected and accelerated the erosion of the coastline in many areas. It was estimated that the dam constructed on the river 'Meliane' stopped 48 million m³ of sediments from coming to the sea in the last 20 years.⁵⁷

Another negative impact of the construction of some dams is what is observed now in the lake of Ishkel (a national park). The construction of two dams on the two main fresh water supplies for the lake has seriously affected the water level and salinity.

1.7 TOURISM SOURCES

The tourism industry is the first activity, after the fishing industry, benefiting from the sea. More than 90% of the hotels are lying along 100 km of coastline.⁵⁸ It is expected to be the most environmentally friendly, but like any human activity it has its own environmental problems.

Beach occupation and sand extraction are the first negative results of hotel building. Pleasure ports and other structures are built in many cases on an area claimed from the sea. All these perturbations result in the degradation and the erosion of the coastline in many regions (Tunis, Sousse, Monastir, Djerba, Zarzis).

The increasing number of pleasure boats is becoming one more source of marine pollution by the amount of wastes they discharge deliberately into the sea (oily water, garbage, sewage). The impact on human health can be really serious through the bacteriological pollution of bathing waters. What must not be ignored is the disturbance, however small, caused to marine organisms by the propulsion engines of thousands of pleasure boats having their exhaust pipes under water, releasing a considerable amount of thermal energy and toxic gases into the sea water. These boats represent a real threat to the coral and sea grass.

As discussed before, the number of 150,000 beds located in the coastal areas, fully occupied during summer time, shows the gravity of the customers' wastes (sewage and garbage) and the difficulties in handling them.

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CHAPTER II

INSTITUTIONAL AND LEGAL FRAMEWORK DEALING WITH THE MARINE ENVIRONMENT

2.1 Institutional framework and the role of different institutions in dealing with the marine environment

The institutional framework for environmental management was built up gradually by sectors to respond to the environmental problems generated by the economic development and the population growth. Many environmental departments were created in several ministries, but this was not satisfactory to promote an overall and integrated approach.

In 1978, a National Commission on Environment was created as a co-ordinating body. Its objectives, as defined in Article 2 of the Decree n.78-373 of 12-4-1978, were to elaborate a global environmental policy in co-ordination with all the departments and services concerned. This unclear definition and limited prerogatives made it inefficient and kept it as a consultative body.

Recommended by the National Commission on Environment, a National Environment Protection Agency (NEPA) was created in 1988 as a public agency having an industrial and commercial vocation. Four years later, a Ministry of Environment and Land Use Planning was established followed by the Littoral Protection and Planning Agency in 1995, to reinforce the substantial efforts made by the NEPA in the environmental protection policy.

2.1.1 The role of the Ministry of Environment and Land Use Planning

Created in November 1991, the Ministry of Environment and Land Use Planning had to wait until 1 February 1993 to see its role, functions and organisation officially defined.

The role of the Ministry of Environment as laid down in Article 2 of the decree n.93-309 of 1 February 1993 is:

- to include the environmental factor and concerns in the economic and social development plan;
- to co-ordinate the governmental actions in the field of environment protection and nature conservation including control, prevention, reduction and elimination of pollution, harm and all risks affecting the environment from all sources;
- to elaborate in co-ordination with the Ministries and organisations concerned waste discharge and emission standards for industrial, urban, agricultural, tourist, energy and transportation activities;
- to approve investments for the projects related to environment protection, to encourage their development and to follow up their implementation;
- to promote all actions for awareness raising or research related to environment protection in co-operation with organisations and associations concerned;
- to co-ordinate between the national and international programs dealing with environment protection;
- to implement the international agreements related to the environment;
- to represent the state in the international meetings and bilateral and multilateral meetings dealing with environment protection in co-ordination with other Ministerial departments concerned;
- to elaborate a national contingency plan for pollution and major accidents and to follow up its implementation in co-operation with other Ministries concerned; and,
- to promote, in co-operation with other Ministerial departments and organisations concerned, all scientific, technical and economic research having for an object the improvement of environmental protection techniques.

This is a broad definition of the role and functions of the Ministry of Environment. More details were given in the Decree n.93-304 of 1 February 1993, dealing with the organisation of the Ministry. In this central organisation there is no specific department dealing with the marine environment as exists for the rural environment. But later on, in 1994, came the organisation of regional services of the Ministry with the creation of six regional directorates in which three are responsible for the coastal zone and have a specific service dealing with the marine environment. Their role as laid down in Article 6 of the decree n.94-1636 of 1 August 1994 is:

- to control and study the factors of degradation of the littoral and to propose measures for the protection of the sensitive zones;
- to prevent the risk of pollution of beaches and to give technical assistance to local authorities in protecting and recreating beaches; and
- to elaborate and implement the protection and planning programs in the coastal zone.

2.1.2 The role of the National Environment Protection Agency

The National Environmental Protection Agency (NEPA) was created in 1988, to provide an efficient response to present and future needs in the area of environment management. The role of this agency was laid down in the Law 88-91 of 2 August 1988. It has the responsibilities:

- to participate in elaborating the general environmental policy and its implementation;
- to propose to the authorities general or specific measures needed for the implementation of the environmental policy and the prevention of the risks of major disasters, either natural or industrial;
- to respond to all sources of pollution and all aspects of degradation of the environment;
- to control the discharge of pollutants and treatment facilities;
- to follow in co-operation with other Ministries or organisations concerned, scientific and technical research dealing with the environment; and
- to promote all actions of education and training in the field of environment protection.

The NEPA was also assigned the task of approving Environment Impact Assessments which were rendered mandatory for any industrial, agricultural or commercial project presenting a probable risk of pollution or degradation of the environment. To accomplish this mission the NEPA acts within the whole national territory and in the waters which are under the sovereignty or the jurisdiction of the Tunisian state.

The NEPA was initially accountable to the Prime Minister's office but later was shifted to the Ministry of Environment to become its main executive body. The NEPA

is empowered to sue any person or institution for the damage they cause to the environment. It has its special officials responsible for the control of the function and efficiency of waste treatment facilities. They have the judicial power of access to any public or private institution to control waste discharge standards and to take samples needed for bacteriological, chemical and microbiological tests.

2.1.3 The role of the Coastal Zone Protection and Planning Agency

To put an end to the anarchic situation in the management of the coastal zone, this agency was created in 1995, a specialised agency accountable to the Ministry of Environment, responsible for the global and integrated management of the coastal zone. Its role as defined in Article 3 of the Law n.95-72 of 24 July 1995, is:

- to execute the national policy in the field of the protection of the coastal zone in general and the maritime public area in particular;
- to manage the coastal zone, follow the planning operations and control the conformity with regulations;
- to elaborate the studies and research related to the protection of the coastal zone; and
- to observe the changes in the ecosystem using new technologies.

This newly established agency is expected to play an important role in reducing the pressure on some sensitive areas in terms of urbanisation, industrialisation, waste disposal and other uses of the coastal zone, since all activities in the coastal zone are subject to the authorisation of this agency.

2.1.4. The role of the Maritime Administration

The Maritime Administration was the first and oldest department to deal with the marine environment since Tunisia has ratified almost all the international conventions and agreements dealing directly or indirectly with the marine environment.

The Maritime Administration, called the Directorate General of the Merchant Marine (DGMM) is responsible for all maritime transport and shipping activities and part of the fishing industry. Its role and functions are laid down in Title 6 of the Decree n.91-86 of 14 January 1991, dealing with the central organisation of the Ministry of Transport. Regarding marine environment protection, the DGMM was assigned the

responsibility to participate in marine pollution response operations. It is also a member of the special commission on marine pollution from ships.

It could be understood that the marine environment is a secondary concern for the Maritime administration, but the DGMM still has a leading role in preventing marine pollution from ships since it is the main body responsible for the safety of maritime navigation and the safety of ships. The DGMM is responsible for the implementation and enforcement of the international conventions and agreements related to safety at sea and marine pollution. It exercises port state control in all national ports and the control at sea within the limit of 3 nautical miles. It is responsible for investigating accidents at sea and dealing with wrecks.

The DGMM is responsible for the survey and certification of all ships flying the national flag and for the approval of the equipment required by the international conventions. What must be mentioned here is that the DGMM delegates part of its authority to some classification societies to carry out surveys and certification of merchant ships under the provisions of SOLAS 74 and MARPOL 73/78. All motorised fishing vessels are subject to annual surveys which enhance safety at sea and consequently improve the prevention of marine pollution resulting from accidents

The DGMM, in co-operation with the port authorities, is setting up rules regarding reception facilities for all kinds of wastes generated by ships in all commercial ports. With its presence on the scene in some 25 different ports along the coast, the DGMM is expected to play an important role in controlling and monitoring the marine pollution from all kind of ships.

2.1.5 The role of the International Centre for Environmental Technologies

The establishment of the International Centre for the Environmental Technology in 1996 represents another step made by the government to improve environmental policy. It provides a new tool to give scientific and technical support to other institutions involved in environmental matters. As defined in Law n. 96-25 of the 25 March 1996, its mission is to acquire, adapt and develop the new techniques and to

promote Eco-Technology, strengthen the national capacity and to develop the scientific knowledge for the regional and national needs. It has:

- to train experts and technicians in the field of environmental technology;
- to transfer, adapt, and develop environmental techniques, and to make them available for national, regional and international users;
- to give support to new inventors in developing and implementing their research in the field of environmental techniques;
- to co-operate with the industrial and scientific institutions to develop an environmental industry; and
- to carry out the technical studies needed by the Ministry of Environment.

2.1.6 The role of the local authorities

Local authorities play a major role in developing and implementing the environmental policy. Municipalities in some 257 cities, most of them on the coastline, are dealing with environmental matters in their day-to-day work. They are responsible for the management of the solid wastes in all cities and the waste water in some of them. Municipalities are also responsible for the enforcement of the Urbanisation Code by controlling building activities in municipal areas including the coastal zone. They have to look after the cleanliness of more than 100 km of beaches in summer time. Some municipalities are carrying out awareness raising campaigns among the general public, with special attention given to the marine environment in terms of quality of bathing water and cleanliness of beaches. Local authorities are consulted when giving authorisation for maritime pleasure activities and are taking part in local contingency planning.

2.1.7 The role of the Non Governmental Organisations (NGOs)

These organisations are mainly based on the voluntary actions of some people who are conscious of the environmental problems. Their number is increasing every year; there are about 70 organisations throughout the country. They have different names and structures but they have almost the same commitment to protect the environment in general. The NGOs play the first role in raising the awareness of the general public about the environmental problems, they make the bridge between the authorities and

the general public. Their main activities are meetings, workshops, conferences and specific environmental studies.

Some of these organisations are very active at the regional and international levels; they are co-operating with other NGOs in other countries and they manage to attend some meetings and conferences of a high international level. The NGOs, as many independent organisations, are financially handicapped; their main source of financing comes from their membership contributions. Industrial institutions still consider these organisations useless, if not a potential threat to their activities. NGO actions can be improved by the support of the commercial and industrial institutions which can benefit from the studies they make about the environmental impact of the activities of those institutions. NGOs are helping the authorities in monitoring the pollution in many sensitive areas.

2.1.8 The role of the National Sanitation Agency (ONAS)

Before the establishment of the National Sanitation Agency on 3 August 1974, the task of managing waste water was shared by different institutions, the Municipalities, the Ministry of Equipment and the Ministry of Agriculture. That task had been carried out for many years without any planning to respond to industrialisation and urban growth. A new approach had to be adopted, grouping all activities under the responsibility of a single body, having for a mission the management of waste water in industrial, urban and tourist areas and being responsible for the construction and maintenance of the sewage systems.

In 1993, the role of the National Sanitation Agency was redefined by Law n.93-41 of 19 April 1993, when it became accountable to the Ministry of Environment with the responsibility for:

- preventing all sources of water pollution;
- managing, maintaining and renewing the sewage network, especially the treatment plants and the sea outfalls in all industrial, urban and tourist areas;
- promoting and distributing the water, sludge and other products coming from the treatment plants;

- developing and executing integrated projects involving waste water, storm water and household wastes in municipal areas;
- participating in the elaboration of legal instruments related to the prevention of water pollution; and
- undertaking actions of raising public awareness, education, studies and research in the field of water pollution prevention.

2.1.9 The role of the National Commission on Sustainable Development (NCSD)

Following the creation of the commission on sustainable development by the UN Economic and Social Council after the UNCED held in Rio in June 1992, the Tunisian authority felt the necessity to take immediate action towards the implementation of the principals adopted during that conference. A National Commission on Sustainable Development was established on 11 October 1993 with the mission to develop and implement a strategy and a national action plan for sustainable development.

The role and functions of that commission as defined in Decree n.93-2061 of 11 October 1993 are:

- to insure the adequacy of the development and the preservation of the ecological balance;
- to preserve the right of future generations to a healthy environment;
- to put an end to irrational production and consumption modes;
- to promote the clean industrial production and prevent industrial pollution;
- to preserve the biodiversity and the ecosystem;
- to apply the principal of "the polluter pays" and propose regulatory measures to reduce pollution;
- to strengthen institutional structures and procedures to include environmental considerations in the decision making process; and
- to formulate an integrated planning system and an integrated management system for natural resource use.

The NCSD is, first of all, a co-ordinating body acting between different institutions involved in the development process. The Commission, headed by the Prime Minister, has permanent members from several Ministries and governmental and non-governmental organisations. It also has, a technical committee dealing with environmental matters. This committee has 8 sector sub-committees responsible for specific environmental problems. The NCSD has to meet at least once a year and has to submit an annual report to the President of the Republic.

2.1.10 The role of other institutions

Many other governmental institutions are playing an important role in drawing up or implementing the marine environmental policy. The Ministry of Agriculture is directly involved in this matter since it is the main authority dealing with the living resources of the sea, the fishing industry, marine scientific research, education and training of fishermen. It is responsible for the introduction of the environmental concept in the management of the fish stock, in the management of the fishing fleet and the fishing ports and in their training programs.

The Ministry of Public Health is responsible for the control of water quality in sensitive areas and the control of fish quality in the market. It has to work in close co-operation with the Ministry of Agriculture in this respect, providing substantial scientific support.

The Navy, the Customs and the National Coast Guard play the key role in the enforcement of the marine environmental regulations in the national ports, in and beyond the territorial waters. They are contributing to the reduction of marine pollution by intentional discharge and dumping from ships and the reduction of illegal fishing in sensitive areas. They are also expected to play an important role in the national contingency plan for the response to marine pollution.

2.2 MARINE ENVIRONMENT LEGAL FRAMEWORK

The legal framework dealing with the marine environment is formed by two components: the national legislation and the international conventions and agreements

to which Tunisia is party. Before going into details of these instruments one should have an overview of the legal system and the legislation process in Tunisia. In its constitution, Tunisia has adopted the separation of the three main authorities: the Legislative (Chamber of Deputies), the Executive (Government) and the Judicial (different courts).

The national legislation has three levels: In the first and highest level comes the law which has to be adopted by the legislative authority after being approved by the president of the Republic. Laws are drafted in the governmental department concerned. As subsidiary legislation and at a second level, Decrees are issued by the President of the Republic for the application of the laws already enacted. Decrees are drafted by the ministerial department concerned and approved by an administrative tribunal. The third level of regulations are the Ministerial Orders, which are issued by the minister concerned with the application of the above legislation. In most cases these deal with technical aspects and procedures.

All of these three levels of legislation have to be published in the Official Journal of the Tunisian Republic (JORT) to be executed. One can consider a fourth level of regulation which is taken within a specific department, as Circulars in order to provide better understanding and effectiveness of some of the regulations dealt with in day-to-day departmental work. These Circulars are not officially published, but are communicated to the different services within the same department as information and for application.

The ratification of an international convention or agreement has to be adopted by the legislative authority and officially published in the JORT in order to be executed as a national law. As a practice the text of the convention or agreement is either totally reproduced or simply annexed to the law of adoption when it is published, this depends on how big the instrument is. All legislation has to be published in the national language (Arabic), but this is not always respected. A second problem with official publication of international legislation is the amendments to these instruments which fall under the tacit acceptance procedure. Once they enter into force they are

considered changes to the national laws, since the mother instrument is considered as a national law. Therefore, these amendments have to be officially published, which has not been done for either SOLAS 74 or for MARPOL 73/78, the conventions which have changed the most.

2.2.1 National environmental legislation

Until recent times one could not talk about a national environmental legislation. In fact the first proper environmental regulations came in the late 1980s. This legislation is still scattered in many pieces of regulations dealing with different matters, which makes it difficult to grasp in its entirety. Here a focus is provided on those parts dealing with the marine environment, putting them into three main groups according to whether they deal with pollution prevention, waste management or natural resource management.

2.2.1.1 Prevention of marine pollution

Although it is one of the latest regulations, issued on 13 March 1991, Decree n.91-362 related to Environmental Impact Assessment (EIA) can be considered the most important text in terms of pollution prevention. This Decree set up, for the first time, the obligation to carry out an EIA prior to the realisation of most projects (Art.4). The same requirement applies to any substantial modification in a project subject to an EIA (Art.7). These projects are listed in annex I to the Decree. One can identify 16 projects out of the 32 listed that have a direct or indirect link with the marine environment:

- Crude oil refineries
- Electrical plants having a power over 300 MW
- Chemical plants involved in the production of medicines, pesticides, paints, etc.
- Oil & gas exploration and production activities
- Ports construction (commerce, fishing, pleasure)
- Cement factories
- Installation for the storage or the elimination of wastes
- Installation for the production of steel or non ferrous material
- Paper factories

- Tanning factories
- Dams and other installations for the retention of water
- Sub-sea pipelines
- Tourism units with more than 250 beds
- Waste water treatment plants
- Textile and tinting factories
- Industrial areas planning

For some other activities, judged to present less of a risk to the environment, listed in annex II to the Decree, it was required to submit to the authority in charge of the approval of the EIA, a detailed description of the project and the possible affect on the environment (Art.5). Among the projects listed in annex II one finds many activities involving the marine environment such as shipyards, storage of oil, gas and chemicals, food processing and the chemical industry.

By applying the EIA to industrial, agriculture and commercial activities as well (Art.14), the environmental concept is introduced in all development activities. The marine environment is the first to benefit from this process since the major part of these activities are located in coastal areas. Special care is given to national parks and to the specially protected areas (Art.11). Projects expected to affect National Parks or protected area have to be approved by the authority in charge of the management of that park or area, in addition to the normal approval by the NEPA.

The second fully environmental regulatory text was issued on 2 January 1985, in the form of Decree n.85-56 regulating discharges into a receiving environment. Pollution was clearly defined as : “the introduction directly or indirectly by man of substances or energy in the receiving environment causing alteration or damage to water resources, biological resources, human and animal health, or affecting the normal use of the receiving environment” (Art.2).

Receiving environment means the sea, lakes, lagoons, rivers and irrigation canals (Art.2). From here one understands the link of these regulations to the marine

environment. These regulations can be considered the tool to prevent and reduce water and marine pollution from all sources. The discharge of substances, regardless of their origin, has to respect certain standards and must not affect the quality of the receiving environment (Art.3). This obligation is emphasised in art.6 saying that if the discharge of waste water into the receiving environment cannot respect the standards it has to be discharged in the public sewer with respect to the regulations for connections to the public sewer. At the same time, waste water from the public sewer, together with waste water from industrial, agriculture, commercial activities and from ships, has to be treated prior to the discharge into the receiving environment (Art.6).

The discharge of hydrocarbon, vegetable or animal oil is forbidden in the rivers, lakes, dams, aqua-culture and bathing areas and on the coastline (Art.10). The open sea is not covered by this interdiction, nevertheless the washing of tanks containing pollutant or toxic products is forbidden in the areas mentioned above. Pollution by some products like mercury, cadmium, heavy metals, lubricating oil, plastic, halogens and phosphorous elements is required to be eliminated by Article 8.

It was decided that any discharge of such substances required authorisation (Art.12). This authorisation is given by the authority entitled to approve the project (Art.15), substituted by the NEPA in the case of a project falling under the provisions of the EIA.

The criteria for the delivery of the discharge authorisation are fixed in Article 19 taking into account three main points:

- a- the nature and composition of the effluent: source, quantity, mode of discharge, concentration of principal elements, and the physical, chemical and biological proprieties of the effluent;
- b- the nature of the receiving environment: water exchange and quality, vicinity of other vital activities, dispersion possibilities and ability to absorb wastes;
- c- the toxicity of the effluent: physical and chemical persistence, sediment accumulation, affect on dissolved oxygen and interaction with other existing elements.

For the purpose of monitoring any discharge, an installation has to have sampling and flow measuring devices (Art.22). Periodical controls are required (periodicity is not fixed) for installations subject to authorisation. Results are logged in a record book kept for the purpose (Art.14). There is no mention of the points to be covered by the periodical control, or the form of the record book, but it might be prescribed in the authorisation. Random inspections are carried out by the authority who delivered the authorisation to verify compliance with the regulations (Art.21).

The discharge standards (NT 106002 (1989): Environment Protection-Discharge of effluents in the receiving environment) were fixed by the Ministry of Economy in the order issued on 20 July 1989 after being adopted by the Ministries of Agriculture, Equipment and Public Health. The maximum concentration allowed to be discharged in three different environments (at sea, in the public sewer and in the receiving environment other than these two) for some 55 parameters is fixed. The dosage method for each parameter is fixed by the same order. For hydrocarbons, a concentration of only 10 mg/l is allowed to enter the sea which is below the 15 ppm of the international standards (MARPOL for instance). These are the standards to apply to the oil refineries, the offshore oil & gas activities and to all ships which do not fall under the provisions of international agreements. Marine thermal pollution is covered by these regulations. A limit of 35 °C was fixed for the temperature of any effluent discharged into the sea.

Other limits applying to discharges at sea:

PH	6.5 < PH < 8.5
suspended material	30 mg/l
settling material (after 2 hours)	0.3 mg/l
COD	90 mg O ₂ /l
BOD ₅	30 mg O ₂ /l
mercury	0.001 mg/l
lead	0.5 mg/l
cadmium	0.005 mg/l
pesticides, herbicides, PCBs	0.005 mg/l

The limits set up for discharges into the receiving environment other than the sea or the public sewer (lakes, rivers, dams) are more stringent for all parameters, the reason is that they are more sensitive and have less capacity to absorb pollution.

Another provision prohibiting the introduction of pollutants into the environment is found in law n.88-91 of 2 August 1988, related to the establishment of the NEPA. Individuals and institutions whose activities are causing pollution to the environment by the discharge of solids, liquids, gases and others must reduce, eliminate, and eventually recuperate their wastes as well as repair any of the resultant damages (Art.8). The violation of this provision is subject to a fine ranging from 200 to 50,000 dinars (Art.11). The persons involved in a violation can transact with the NEPA in order to stop the prosecution but remain totally responsible for the execution of obligations to eliminate the pollution and repair the damage (Art.11).

In application of Law n.89-21 of 22 February 1989, related to wrecks, any person who deliberately causes the grounding of a ship in waters under the national jurisdiction or the sovereignty and who does not proceed to its recuperation in a reasonable time is punished by imprisonment of six months and a fine ranging from 1,000 to 10,000 dinars (Art.16). This provision, considered to have the potential to substantially contribute to the prevention of marine pollution, is difficult to effectively enforce for two reasons. One is that the act has to be deliberate for these provisions to apply, which is not easy to prove. Two is that the reasonable time for recuperating the wreck is initially undetermined, and when determined is usually contested by the shipowner or the master. This time can be enough to cause significant damage to the marine environment before the authorities can legally act.

The provisions of the Maritime Disciplinary and Penal Code (Art.80 and 81) are applicable in the case of negligence resulting in the grounding of a ship. The author of the infraction is subject to a fine and imprisonment penalties, which can be very high in the case of total loss of the ship or personal injury. These regulations and penalties can dissuade people from deliberately disposing of their old ships in national waters

which has been the case for many years. They can also make mariners take more care to prevent accidents when navigating in national waters.

2.2.1.2 Waste management

Wastes of all kinds have been managed in an anarchic manner for a long time. The burden was placed totally on the local authorities. The first step to regulate this field was taken on 16 October 1982, when Decree n.82-1355, dealing with the collection of used oil, was issued. Collecting, transporting and recycling activities were regulated, taking into account the environmental considerations, institutions and individuals carrying out these operations, which were required to have special permits (Art.4 and 8).

A global and integrated approach to waste management materialised as a result the newly enacted law n.96-41 of 10 June 1996, which covers all kinds of wastes including dangerous wastes (the list is to be fixed by further decree), and applies to all activities related to waste management (Art.2).

The producer of wastes is completely responsible for the management of the wastes in compliance with the related regulations (Art.4). In case the producer fails to meet these obligations, and when the wastes present a risk of pollution to the environment, the authority proceeds to the elimination of that risk at the expense of the producer (Art.5). This is a real materialisation of the principle of the polluter pays. The management of household wastes is left to the municipal authorities, and can be delegated to public or private enterprises (Art.20).

The use of sites for the purpose of collection, separation or recycling of wastes became subject of the authorisation of the Minister of Environment, including an EIA (Art.17). The authorisation of the Minister of Environment is required for the practice of any activities in connection with the management of wastes (Art.26).

It is required that the management of wastes must not affect the environment (water, air, soil, fauna and flora). Special attention is paid to the management of some particular wastes like hospital wastes and sludge from water treatment plants (Art.24),

Regulations are more severe when dealing with dangerous wastes, the mode of management and the equipment used must be approved by the Minister of Environment (Art.31). Mixing dangerous wastes together, or with, other non-dangerous wastes is strictly prohibited (Art.32). By banning the incineration of wastes in open areas (Art.7), an end was put to the most common practice of dealing with wastes.

Restrictions were put on the utilisation of some recycled material which cannot be used for packaging food products (Art.13). In the same way, packaging material being used for chemical products cannot be reused for handling food products (Art.14).

The importation of dangerous wastes was completely banned (Art.39). The same applies to the exportation and transit of dangerous wastes for destinations in countries that prohibit the importation of such wastes (Art.40). The regulations are flexible with respect to import, export and transit of other categories of wastes, which can be allowed in some conditions (to be fixed by a further decree) (Art.41).

The institutions involved in the production, transport and management of dangerous wastes are liable for the damage resulting from their activities, being required to carry insurance covering their liability (Art.34). A limitation for their liability is to be fixed by a decree. In addition these institutions are required to regularly communicate information about the quantity, characteristics, origin, destination, mode of management, accidents and measures taken to reduce the production of those dangerous wastes (Art.34). They are also required to have a record book where they log all the operations they carry out. The book must be kept for a period of 10 years (Art.33).

All institutions involved in the management of all kinds of wastes are subject to random inspections carried out by the authorities dealing with public health or the environment (Art.27). There is an obligation for everybody to inform the authorities dealing with the environment in the case of accidents or threats to human health and

the environment resulting from operations involving the discharge, storage, transport or treatment of dangerous wastes (Art.44).

Because sanctions and penalties are still one of the main factors to ensure the effectiveness of the regulations, three sets of penalties were included in the law dealing with waste management. Penalties are at three levels depending on the gravity of the violation, the first level consists of a fine of 100 to 50,000 dinars (Art.46) and applies to violation of the rules of management of non-dangerous wastes, and to violation of administrative procedures. The second level of penalties consists of the same fine plus imprisonment of 2 to 24 months (Art.47). This level applies to some serious violations of the regulations dealing with dangerous wastes. It is provided in Article 51 that the author of infractions covered by these two levels of sanctions can transact with the authority in charge of the environment in order to stop the prosecution. The third level of penalties, which is not subject to transaction, is more severe. It consists of a fine of 10,000 to 500,000 dinars and imprisonment of one month to 5 years (Art.48). This level applies to infractions involving export, import, mixing and disposal of dangerous wastes.

2.2.1.3 Management of natural resources

Marine natural resources in Tunisia are of great importance due to their contribution in assuring the national autonomy in terms of food and energy, in addition to their contribution in the earning of foreign exchange, so their utilisation has to be managed in a sustainable manner. The only way to reach this goal is by regulating the different activities involving living or non-living resources. Sea bed mining is not regulated yet, oil and gas being the only resources extracted from the continental shelf. Exploration permits granted to oil companies require the approval of the legislative authority (chamber of deputies) which takes the form of a law.

Regarding the living resources, regulations dealing with fisheries have been changing throughout the years and getting more and more stringent due to the depletion of the fish stock and the changes in fishing practices. The latest regulations, which can be considered the most comprehensive of all previous ones, were issued on 28

September 1995, by an order of the Minister of Agriculture who is in charge of the fisheries in application of law n.94-13 of 31 January 1994, related to the practice of fishing activities.

Importation and building of new ships is subject to a prior authorisation of the authority in charge of the fisheries (Art.3). This is enough to put an end to the anarchic growth of the fleet in terms of types and size and to control its geographical distribution. Fishing areas were clearly defined (Art.4) and the number of fishing authorisations to be granted in each area is fixed by the authority in charge of the management of such areas (Art.5). Fishing was totally prohibited in some specially protected areas (around the islands of La Galite, Galiton, Zembra and Zembretta to the extent of 1 to 1.5 miles), around the offshore oil wells (only 500 m), in ports and within 500 meters of the coast (Art.25).

Some fishing practices were also prohibited in some other areas and for certain periods of the year (Arts.26, 27, 28 and 29). Special regulations were set up for the use of certain species, coral (Art.31), sponges (Art.32), lobsters (Art.33) and shrimp (Art.34 to 40). Some species threatened by extinction like seals and turtles are protected by these regulations. Their capture is totally prohibited (Art.9), a minimum size being fixed for the rest of the species (Art.9).

The equipment used in different fishing techniques is regulated in number and size in order to protect some species (Arts.12, 13, 14, 16, 17 and 20). Other equipment, like drift nets, electrical or remote controlled equipment are completely banned due to their destructive effect on some living resources (Art.18). The different fixed fisheries, located in Ghar elmelh and La Chebba are regulated in terms of number, size and the number of users (Arts. 51 to 56).

2.2.2 The international marine environmental legislation

The list of international treaties dealing with the marine environment is very long and difficult to cover in a few pages. Here the discussion will be limited to the conventions and agreements to which Tunisia is a party. All their requirements will

not be reproduced but there will be an emphasis placed on their implications on national legislation, administration and economy, and on Tunisia's involvement in those instruments as a coastal state, flag state and port state. Tunisia very actively participated in the development and adoption of a number of international treaties, especially those dealing with marine safety and environment protection developed under the auspices of the International Maritime Organisation (IMO). It has ratified almost all of IMO's conventions and protocols; it has also ratified the United Nations Convention on the Law Of the Sea 1982 (UNCLOS) and the Convention on the Protection of the Mediterranean Sea Against Pollution, Barcelona 1976 with its four protocols.

UNCLOS can be considered as an umbrella for all international marine environmental treaties for two reasons. First, it has defined and clarified the jurisdiction and sovereignty rights of coastal states in different zones of the sea forming the baseline for the implementation of any maritime treaty. Second, it has provided a global approach to the control of marine pollution and the management of marine resources.

The protection and preservation of the marine environment became an obligation for all states that are parties to the conventions (Art.192). Parties are required to take the necessary measures to ensure effective protection for the marine environment (Art.145). These measures have to be taken individually or jointly in the form of rules, regulations and procedures with the aim to prevent, reduce and control pollution from all sources, land-based, atmospheric, dumping, seabed activities and from ships (Art.194). The Convention encourages states to develop new global and regional treaties and to enforce the existing ones falling within their general principals (Art.237).

There is no doubt about the relevance of this Convention to a country like Tunisia with few natural resources on land and having a long coastline and a large continental shelf rich in natural resources. There is a need for such an international legal framework to recognise the delimitation of its sea boundaries and its rights to the use

and protection of its resources within its boundaries which can be considered as the first positive economic implication of the Convention, besides the political implication on the relationship with the neighbouring countries, Tunisia had to go to the International Court of Justice to settle the continental shelf boundaries dispute with Libya in 1982, while the problem with Italy was settled through a bilateral agreement.

It must be mentioned here that Tunisia has been claiming 12 miles as a territorial sea since 1973. A long time before UNCLOS, it was in favour of the establishment of an Exclusive Economic Zone (EEZ) of 200 miles, but it has abstained from doing so for the reason that none of the other Mediterranean countries have done so. This is understandable because if all countries decide to establish an EEZ to the maximum extent only a small area of the sea, the size of the island of Sicily, will be left under the regime of the high seas which is viewed by many countries as unnecessarily restricting the freedom of the seas. Tunisia is claiming a historical right to use the living resources in many areas beyond the territorial sea which compensates or minimises the loss of the rights of the EEZ.

It is difficult to judge whether Tunisia has met its obligations of protecting the marine environment, but one can say that it has done so in terms of participation in developing international regulations and procedures. However, the question remains if it can meet the obligation of enforcement of those regulations.

2.2.2.1 Pollution from land-based sources

This type of pollution involves all countries regardless of their location, size or level of development. It has been, and still is, a big concern of the international community. It was dealt with in a number of regional treaties. In Article 207 of UNCLOS, states were required again to adopt laws and regulations to prevent reduce and control pollution of the marine environment from land-based sources taking into account the internationally agreed rules and the level of development of some countries. States are required also, in Article 213, to take appropriate measures to put into effect the regulations adopted nationally and internationally.

In the absence of a global instrument, countries started since the early 1970s to establish regional agreements, the Stockholm convention adopted on 19 February 1974 being the first one. Conscious of the gravity of the situation in the Mediterranean Sea, the bordering countries adopted in 1976 a Convention for the Protection of the Mediterranean Sea Against Pollution, referred to as the Barcelona Convention, to which Tunisia is party. In application of Article 8 of the Convention, states are required to take all appropriate measures to prevent, abate and combat pollution of the Mediterranean Sea area caused by discharges from rivers, coastal establishments or outfalls, or emanating from other land-based sources within its territory, almost the same requirements as article 207 of UNCLOS.

Four years later (Athens 1980) the Mediterranean countries met again and adopted a Protocol to the Barcelona Convention dealing with the protection of the Mediterranean Sea against pollution from land-based sources. Article 1 of the protocol was a total reproduction of article 8 of the mother convention, but the protocol came with new obligations for the parties consisting of monitoring the level of pollution along their coasts (Art.8) and the obligation of co-operating in the scientific and technological fields, exchanging scientific and technical information and co-ordinating their research programs (Art.9). There is an obligation under Article 12 for consultation between parties to the protocol in case land-based pollution generated in the territory of one party is likely to affect the interests of other parties. The other obligation for the parties is to inform each other with the results achieved and the problems encountered in the application of the protocol (Art.13).

The most important in the protocol is what came in Articles 5 and 6 and the three annexes to the protocol. Annex I consists of a list of substances and groups of substances which, according to their toxicity, persistence and bio-accumulation, are considered to have a large effect on the marine environment. Pollution by these substances from land-based sources has to be eliminated (Art.5).

Annex II contains a list of substances and sources of pollution which according to their toxicity, persistence and bio-accumulation, are considered less noxious than those listed in annex I. Pollution by these substances has to be strictly limited (Art.6).

Parties were required to establish standards and programs for the implementation of these provisions. They were required also to impose authorisations for the discharge of wastes containing these substances taking into account the criteria existing in annex III to the protocol for the issue of the authorisations (Art.6).

Tunisia has real concerns about the protection of the Mediterranean Sea, because of its dependence on the sea for its economy (fisheries and tourism). So, the 1980 Protocol was to Tunisia's advantage despite all of its implications. Implementing the provisions of the protocol is not an easy task. Expensive infrastructure, equipment and a monitoring network are needed to eliminate or limit the pollution from the discharge of wastes into the sea. Changes in the legislation seem to be the easiest of all of the obligations; regulations and standards for the discharge of effluents to the receiving environment were nationally adopted since 1985. Decree n.85-56 of 2 February 1985, (already discussed), is an entire reflection of the 1980 Protocol and its three annexes with the only difference being that the decree applies to all sources of discharge (land-based, ships and offshore activities), while the protocol applies only to land-based sources. Beside these regulations, Tunisia adopted a long term program to control land-based pollution called "Blue Hand" (to be discussed in the next chapter).

2.2.2.2 Pollution from dumping

Prevention, reduction and control of pollution of the marine environment by dumping is an obligation of states party to UNCLOS. They were required to adopt laws and regulations and to take the necessary measures to cope with that obligation (Art.210). At the same time they were required to impose a permitting system for dumping within the territorial sea, the EEZ and onto the continental shelf, taking into account the interests of neighbouring countries when granting such permits. States party to UNCLOS were also required to establish global and regional agreements aiming to prevent, reduce and control marine pollution by dumping.

The global instrument for this was already in place in 1972: The International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters (London Convention 1972). Regional instruments as well, have been put in place following the adoption of the LC 1972, with several regions agreeing to deal with marine pollution by dumping. As far as Tunisia is concerned, the Barcelona Convention and its Protocol No1, adopted in 1976, are the relevant regional instruments. On 21 January 1976, Tunisia became a party to the LC 1972 by accession, 26 days before the adoption of the Barcelona Convention and its first Protocol. This was not simply a coincidence, as it explains the link between the two instruments as viewed by the Tunisian authority and their relevance to the situation of the country.

Under the provisions of LC 1972 (Art.4), the dumping into the sea of the wastes listed in Annex I to the convention is strictly prohibited; wastes listed in Annex II to the convention need a special permit to be dumped; the rest of wastes can be dumped legally subject to obtaining a prior general permission. Dumping permits are granted taking into account the considerations laid down in Annex III to the convention.

The same provisions are found in Protocol 1 of the Barcelona convention which has three annexes similar to those of the LC 1972. In both instruments states are required to designate the appropriate authority in charge of issuing the special and general permits, and to keep records related to wastes subject to permits.

In this respect it took a long time for Tunisia to react and adopt the appropriate regulations. The first action came in 1985 when decree n.85-56, related to the discharge of effluents in the receiving environment, was issued applying to all sources, including ships (discussed before). Then in 1996, Law n.96-41 was enacted, relating to the management of wastes, which applies to the disposal of all kind of wastes from all sources into the sea. These two pieces of legislation cover all the provisions of the LC 1972 and the first protocol of the Barcelona Convention. Under the national legislation the dumping of any kind of waste into the sea is subject to an

EIA and to the authorisation of the Minister of Environment. Dumping of the substances listed in annex I of LC 1972 is expected to be prohibited by the authority. The national legislation acts can be applied to foreign vessels and aircraft in the waters under the national jurisdiction, but not in the continental shelf (or in the EEZ), as provided in UNCLOS (Art.216).

2.2.2.3 Pollution from seabed activities

The exploitation of offshore oil resources is contributing 1% of the input of oil into the sea, besides the discharge of many other liquid and solid pollutants, but this sector and other activities associated with the exploitation of the sea-bed are still not regulated at the global level. UNCLOS deals with the subject in Article 208 and requires the parties to the convention to adopt laws and regulations, to take appropriate measures and to establish global and regional rules and standards in order to prevent, reduce and control pollution of the marine environment arising from seabed activities.

At the regional level, most of the agreements dealing with marine pollution cover the subject in the same way, requiring the contracting states to take appropriate measures to prevent, reduce and control pollution of the sea area, covered by the agreement, resulting from the exploration and exploitation of the sea-bed and its subsoil. That was the provision of Article 7 of the Barcelona Convention, which applies to Mediterranean countries and in which Tunisia is directly involved because of the increasing offshore oil and gas activities on its continental shelf. There is no specific regulation for these activities but the provisions of Decree n.85-56, related to the discharge of effluents in the receiving environment, can be once again applied in this situation considering the offshore installations as industrial installations. The appropriate measures that have to be taken to fulfil the requirements of both the UNCLOS and Barcelona Convention go through the EIA required by Decree n.91-362 (discussed earlier).

2.2.2.4 Pollution from ships

Marine pollution from ships is the most globally regulated, not because it is the largest polluter of the seas, but because of the attention accidental pollution gets from the general public when it happens. Another reason is the fact that ships are trading world-wide and this makes it easy to enforce the agreed regulations on those ships in foreign ports. Therefore the shipping industry has to comply with the international legislation to survive, which is not the case of other activities hiding behind national borders. At the beginning, the international community was concerned only with oil pollution which resulted in the establishment in 1954 of the International Convention for the Prevention of Pollution of the Sea by Oil. In time the awareness and consciousness spread to cover other types of pollution caused by ship operations or accidents; this include noxious substances, sewage and garbage. Exhaust gases and ballast water are the new items on the list of ship generated pollution to be regulated in the future.

States are involved in these global treaties in one or more of three different ways: as a flag state for states having ships registered in their territories, and flying their flags, as a coastal state for states having a sensitive coastline, and as a port state for states having ports with considerable traffic.

Tunisia is one of the countries involved in all aspects even though it does not have a large merchant fleet. With the commitment to protect the marine environment, and the determination to protect its interests as a coastal state, it became a party to all the conventions dealing with marine safety and environment protection finding itself under the pressure of several obligations, in most cases difficult to fulfil for economic and technical reasons.

As a flag state party to MARPOL 73/78 Tunisia is required to give affect to the provisions of the convention and its Annexes regarding the inspection and certification of ships flying its flag (Art. I). This provision is emphasised in Article 217 of UNCLOS which requires states to ensure the compliance of the ships flying their flags with the international regulations for the prevention, reduction and control of marine pollution, and to ensure that those ships are carrying on board the certificates required by the international regulations. States are required under the provision of UNCLOS (Art.217) to carry out an immediate investigation if a ship

flying its flag commits a violation of the international regulations. Flag states are also required to conduct investigations of casualties affecting the marine environment and to inform the IMO with the findings of such investigations (Art.12 of MARPOL).

In the national legislation of Tunisia there is no mention about inspections or certification of ships in application of environmental regulations. Article 26 of the Maritime Navigation Administrative Police Code (MNAPC), dealing with the certification of ships, provides that all ships engaged in international voyages shall carry the certificates of safety required by the international conventions to which Tunisia is party. Of course, certificates of safety cannot include the certificates and record books required by MARPOL 73/78. Inspection and certification of ships under the provision of Annexes I and II of MARPOL are carried out by classification societies on behalf of the state. Again there is no mention about the delegation of this authority in the national legislation. Article 28 of the same Code provides that classification societies approved by the Minister in charge of the merchant marine can issue the free-board certificates on behalf of the Tunisian government and carry out inspections of the cargo handling gear. They are also entitled under the provisions of Article 10 of the same Code to issue tonnage certificates.

Investigation is not yet regulated. Accidents of all kinds are investigated by an ad hoc commission formed when necessary by the Minister in charge of the Merchant marine. In terms of sanctions for the violation of the regulations to prevent pollution, required in Article 4 paragraph 1, of MARPOL, the provisions of Articles 8 and 11 of Law n.88-91, together with the provisions of Law n.96-41, can be applied.

Port states have a lot of obligations under the different global instruments. They have the burden to provide in their ports adequate facilities for the reception of ship wastes: oil wastes (MARPOL, Annex I, Regulation 12), noxious substances (MARPOL, Annex II, Regulation 7), sewage (MARPOL, Annex IV, Regulation 10), garbage (MARPOL, Annex V, Regulation 7). Reception facilities have to be adequate in terms of capacity, availability and handling procedures to meet the needs of ships without

causing undue delay. Adequacy includes also the storage, treatment and disposal of wastes which seems to be the most difficult for most states.

UNCLOS, in Article 218, requires the port states to co-operate with the flag state in order to carry out investigation on board a ship calling at their ports that is involved in a pollution incident whenever receiving a request of the flag state. Port states are requested to conduct investigation on board foreign ships in case the ship is suspected of violating the regulations for pollution prevention (MARPOL, Annex I, Regulation 10). Port states have the right under the provision of Article 5 of MARPOL to inspect any foreign ship calling at their ports to verify its compliance with the regulations of the Convention. They are also asked not to give more favourable treatment to ships that are from states that are not parties to the Convention.

MARPOL, and to some extent UNCLOS, are intended to protect the marine environment from the pollution by ships. In other words, they intend to protect particularly the interests of coastal states. The new law of the sea provides coastal states with the right to spread their sovereignty over a large area of the sea and to adopt laws and regulations for the prevention of marine pollution which apply to foreign vessels navigating in that area, but these regulations must not hamper the right of foreign vessels to innocent passage in the territorial sea, or the freedom of navigation in the EEZ. The coastal state intending to adopt such specific navigational or discharge rules in its territorial waters or EEZ has the obligation to communicate its intention to other parties through the organisation (Art.211 of UNCLOS).

In this respect, Tunisia did not adopt any specific rules for navigation in the waters under its jurisdiction. It was provided in article 5 of the Maritime Commerce Code that ships of all nationalities have the right of passage through Tunisian territorial waters provided that they respect the provisions of the international conventions and Tunisian laws. The nature of passage was not clearly defined but what was meant here is the innocent passage as defined in the international conventions, UNCLOS for instance. Discharge conditions in the waters under national jurisdiction are provided

for in the regulations dealing with the management of wastes and the discharge of effluents in the receiving environment.

Marine pollution from ships has been dealt with in many other regional agreements. The Barcelona Convention provides in its Article 6 that states, parties to the Convention, shall take measures to prevent, reduce and control pollution of the Mediterranean Sea from ships, and to ensure the effectiveness of the international regulations dealing with that type of pollution.

Other conventions contributing to the prevention of accidental marine pollution are those dealing with the safety of navigation and the manning of ships (SOLAS 74, LL 66, COLREG 72, SFV 77 and STCW 78). A ship well built, well equipped, well manned and well operated has less probability of having an accident.

2.2.2.5 Preparedness and response to marine pollution

We know that danger begins when one starts to feel safe, whatever the preventive measures. Accidents are possible as long as ships are operated by human beings. Preparedness for a prompt response to accidents is essential to mitigate the effect of such an accident.

In the 1960s, the oil trade and the size of oil tankers began to increase tremendously and oil spills increased accordingly. The international community started to worry about the effect of those spills on the marine environment, especially in the high seas where nobody had jurisdiction or sovereignty. A global agreement was reached in 1969 to regulate the intervention on the high seas in cases of oil pollution casualties. States party to that intervention convention were allowed to take necessary measures to prevent, mitigate or eliminate grave and imminent danger to their coastline or interests from pollution or the threat of oil pollution following a maritime casualty (Art.1). They have to consult experts and other parties affected by the casualty, especially the flag state, before taking such action (Art.3).

In 1973, this right of intervention on the high seas was extended by a protocol to cover pollution by substances other than oil which are listed in the annex to that protocol (Art.1). Intervention can cover other substances not listed, but states have to prove that they could reasonably pose a grave and imminent danger to human health and the marine environment or interfere with the normal use of the sea. With the establishment of an EEZ of 200 miles, this convention and its protocol will lose some of its importance because states will be automatically exercising their right of sovereignty to protect their interests as coastal states over these larger areas.

In the case of the Mediterranean Sea where no EEZ is claimed, the intervention convention and its protocol remain pertinent. However, many Mediterranean countries have not ratified them. The Barcelona Convention in Article 9 requires states to co-operate when dealing with marine pollution emergencies from all sources in the Mediterranean Sea. The same requirement was repeated in Article I of the second Protocol adopted at the same time as the Convention and related to co-operation in combating pollution of the Mediterranean Sea by oil and other harmful substances in cases of emergency. This regional agreement emphasised the co-operation among contracting states, rather than giving the right to intervene beyond a state's boundaries, so it cannot serve as a substitute to the intervention convention.

Contingency plans were required by the Protocol 2 to the Barcelona Convention in its Article 3, and by UNCLOS in its Article 199. States were required to co-operate to develop and promote contingency plans to respond to potential pollution accidents. Ships were required also to carry on board an oil pollution emergency plan approved by the flag state as provided in regulation 26 of MARPOL 73/78 and emphasised by Article 3 of the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC 1990) adopted by IMO in 1990.

In the application of Article 3 of the OPRC Convention, contracting states have to apply the requirement of the oil emergency plans to the offshore units operating in their waters and to ports and oil terminals in their territories. Contracting states were also required to develop national contingency plans for prompt and effective response

to oil pollution accidents (Art.6). They have also to co-operate and provide assistance to the parties affected by an oil accident beyond their capabilities (Art.7).

Being party to all the above global and regional treaties and in order to meet the derived obligations, Tunisia enacted on 3 April 1996 Law n.96-29 related to the establishment of the national contingency plan for response to marine pollution accidents, providing in Article 22 that the manager of commercial ports, fishing ports, pleasure ports, oil terminals and offshore platforms shall develop specific contingency plans to respond to small pollution accidents in the port areas and around the platforms.

Article 23 of the same law provides, that in case of a major pollution accident, necessary measures have to be taken to facilitate the international assistance provided for in the international conventions.

The 1989 Salvage convention (not ratified by Tunisia) contains some provisions with relation to the protection of the marine environment. The public authority is given the right to intervene in the control of the salvage operation in order to remove the threat of pollution (Art.9).

2.2.2.6 Liability and compensation

The liability of the polluter, and the right of the individuals or countries suffering the damage to compensation, have been recognised by the international community in many global and regional treaties. The first liability scheme was established in 1969 following the Torrey Canyon disaster. The International Convention on Civil Liability for Oil Pollution Damage 1969 (CLC 69), as modified by the protocol of 1992, provides that the owner of a ship involved in an oil pollution incident is liable for the damage resulting from that accident (Art.3). The shipowner has the right to limit liability to a certain amount determined in application of the provision of Article 5. Ships engaged in international trade are required to carry a certificate issued by the flag state attesting that insurance or other financial security is available to cover the shipowner's liability (Art.7).

Aware that the limited liability of the shipowner is not enough to cover, in totality, the damage that can result from a major spill, a supplementary compensation scheme was adopted in 1971 requiring the oil industry to contribute in building an international fund for compensation for oil pollution damage. The new Fund convention, as modified by the protocol of 1992, provides the person suffering pollution damage with compensation when the case is not covered by CLC 1969, when the damage exceeds the limitation of the shipowner's liability under CLC 1969, or when the shipowner is financially incapable of meeting the obligations under CLC 1969. These two schemes, after the latest amendments of 1992, became more efficient because the limit for compensation was raised and the coverage was expanded to the EEZ and to pollution caused by oil carried as bunkers.

UNCLOS, in Article 232, holds a state liable for the damage caused when taking measures. In Article 235, states were required to ensure that recourse is available in accordance with their legal system for adequate compensation for the damage to the marine environment caused by persons under their jurisdiction. The Barcelona convention deals with the liability and compensation matters in Article 12 requiring contracting states to co-operate in order to adopt appropriate procedures for the determination of the liability and compensation for pollution damage to the marine environment.

At the national level, liability and compensation for environmental damage is dealt with only in Law n.96-41 related to waste management which provides, in Article 34, that the institutions involved in waste management shall have insurance covering their liability for the damage resulting from their activities. This provision cannot be applied to accidental oil or noxious substance pollution cases.

It must be mentioned here also that the Salvage Convention (1989) provided that the salvor who failed in a mission to save property is entitled to a special compensation covering expenses for preventing or minimising damage to the environment. This provision is very important because it encourages the salvor to engage in pollution combating operations, bearing in mind that they will be compensated for that,

regardless of the result of the salvage operation. This is especially so since the expansion of the international liability and compensation schemes to cover the expenses of removal of threats of oil pollution.

CHAPTER III

MANAGEMENT OF MARINE POLLUTION

Marine pollution is not a new problem for Tunisia, it has existed for many decades, but now with the industrial and urban growth in the coastal zone, the problem takes a new dimension and it has to be considered with more seriousness. There is a need for establishing a strategy for pollution control taking into account the national priorities and capabilities. Besides, the build-up of the institutional and legal framework, a national environmental action program was adopted at the beginning of the decade. This action program included short-term curative programs and long-term preventive programs. Regarding the marine environment, a large program called Blue Hand was adopted containing 12 specific programs:

- management of solid wastes in the coastal zone
- treatment of industrial waste water
- treatment of urban waste water
- construction of appropriate waste water sea outfalls in tourist areas
- use of treated water from treatment plants for the irrigation of vegetation intended to protect the coastline from erosion
- planning of the coastal zone
- protection of the coastline from erosion
- management of oil pollution
- control of pollution from rivers in coastal cities
- protection of beaches
- development of eco-tourism
- monitoring of marine pollution

In addition to the preventive strategy, Tunisia has to be prepared to respond to an eventual pollution incident, so it needs to adopt a response strategy according to the potential threat. Such a strategy should include strong regional and international co-operation.

3.1 POLLUTION CONTROL STRATEGY

The national policy for the control of pollution should be based on the principal of prevention being better than the cure, but some remedial actions need to be taken for the most serious cases of pollution. Public awareness is the challenge of the national policy to overcome the obstacles towards sustainable development. Beside the adoption of the principal of "the polluter pays", financial incentives need to be provided to encourage and promote clean industry and technology. Efforts are being made to provide the country with the required infrastructure and installations for the management of all kinds of wastes. In this part, public awareness, the management of industrial and urban wastes in the coastal zone, the financial incentives and the situation of the reception facilities in national ports are discussed.

3.1.1 Public awareness

To put into effect any adopted strategy, the behaviour of the general public has to be changed. Regulations alone cannot change the behaviour of people. People must be convinced that what they are told to do, or not to do, are important. In a developing country like Tunisia, it is not easy to introduce the environmental and sustainable development concept into the minds of people whose major concerns are in many cases the basic needs of human beings. Raising public awareness is a long-term goal, and a major national program for environmental education and the raising of public awareness was adopted in 1992 with the financial help of the UNDP and the technical assistance of UNESCO and the Canadian International Co-operation Agency. The program targeted the younger generation; school children in particular were involved in the program: 4,100 primary schools, 700 secondary schools, 327 youth houses and 40 non-governmental environmental organisations. The program had five main elements:

- diagnosis of the situation in terms of environmental knowledge and awareness
- drawing the appropriate plan for the implementation of the national program
- production of the pedagogic material for environmental education of the public
- training of people designated to implement the program
- evaluation of the program

The program is showing signs of success. Since its beginning, environmental knowledge has, to some extent, been passed to the children, but their behaviour is still influenced by adults, whose behaviour has not really been touched by the multiple campaigns carried out by the authorities through all means of communication. The municipalities and the Ministry of Agriculture are carrying out their own campaigns to draw the attention of people to the necessity of reducing wastes, controlling pollution and conserving the natural resources. The marine environment was the main subject in most of these campaigns, spots were aired daily on the TV channels calling people to avoid certain illegal and harmful practices of fishing, and to stop throwing wastes overboard or dumping them directly onto the beach.

Unfortunately people still do those things. Why ? The answer is simply because they ignore the reason why they were requested not to do them. The simple fisherman or citizen is not expected to know the environmental impact of such acts. The major deficiency of the environmental campaigns is that they do not explain to people in an easy and clear way how the negative impact of human activities on the environment reduces the quality of life.

The other problem is that the campaigns are not supplemented by concrete actions from the local authorities to assist the citizen or the company to technically or financially be able to change existing practices. The use of different bins for the at home separation of garbage is one example. The idea failed because most citizens cannot afford to handle three different garbage bins at home, neither can the municipalities.

NGOs which were expected to play the major role in raising public awareness, and in making a bridge between the authorities and the general public, could not reach the general public due to their limited capabilities. The weakness of the participating NGOs lies in their lack of co-operative actions. Instead of grouping their resources to form one strong organisation, they have been scattered in many small organisations, unable to achieve their goals. The numbers of their membership reflect the attitude of

the general public towards these NGOs in particular, and to environmental principals in general.

Many other attempts have been made by the authorities to get people involved in environmental activities. It was decided to celebrate regularly and annually:

- a National day for the environment
- a National day for the tree
- a National day for the cleanliness and the protection of the environment

During these days and during many other occasions, seminars, workshops, cultural competitions and other practical activities have been organised throughout the country. School children and young people are still the main attendants. It must be recognised that these programmes and the types of activities conducted are not oriented towards the older generations. For this reason adults have the feeling that they are not concerned with such events.

Coping with this problem can be managed by organising special environmental activities, in connection with professional areas, for the personnel within the different industrial, agricultural, and commercial institutions, where people can feel more comfortable and confident with such activities.

3.1.2 Financial incentives

Giving financial incentives to individuals is one way to change their behaviour. In many cases it works better than regulations and penalties. To motivate people to invest in eliminating or reducing pollution there must be an economic benefit. The Code of Investment Incentives adopted in 1994, gave investors an exemption from paying taxes when importing equipment for the purpose of eliminating or reducing pollution. It also gave subsidies and other advantages to the projects involved in waste management.

A special fund for pollution clean-up (FODEP) was created in 1992 (Law n.92-122 of 29 December 1992) which had two objectives:

- to encourage the private sector to invest in the field of collecting and recycling solid wastes

- to help the industrial sector to acquire the equipment required for the elimination or reduction of pollution.

The fund bears 20% of the total costs and provides 50% as a loan with low interest through commercial banks, the rest (30%) has to be provided by the investor.

With the creation of this fund environmental issues became real considerations for the industrial sector, and many individuals and companies have benefited during the last few years. The fund is primarily financed by the state, that is by the tax payer; the other financial source for the fund is the fines paid by individuals or institutions for violation of regulations related to the management of wastes.

By establishing this fund it is expected that industrial pollution will be reduced, but not eliminated. The required technology for the elimination of industrial pollution is either unavailable or too expensive; many private investors are not able to bear the costs despite the help of the fund. Also, the fund is not intended to clean up previous cases of pollution or repair previously sustained environmental damage. The fund would simply not have the financial resources for this. Other financial sources, based on the principal of the polluter pays, need to be provided if the fund is to expand its activities and capabilities for such purposes.

Another financial incentive has to be mentioned here, its value being more moral than financial. In 1993 it was decided to establish a presidential award for the protection of the nature and environment (Decree n.93-2055 of 4 October 1993, modified by Decree n.96-1248 of 15 July 1996). This approach encourages companies and individuals to consider the environmental ramifications of their projects.

3.1.3 Waste water treatment in the coastal zone

With urban and industrial growth, waste water became a major problem for local authorities; first, because of the continuous demand of new public sewers in new urban areas, and second, because of the need to get rid of that waste water. At the beginning, waste water was disposed of directly into the sea, lakes, lagoons and rivers and the environmental impact was completely overlooked. Providing the urban population with sewerage service was the first priority for the local authorities. This

goal is still not totally achieved because 25% of the urban population is still using septic tanks. What makes the problem more difficult is the use of the same system for the collection of storm water, public wastes and the industrial wastes. Another problem is the connection of the new collection pipes of the new urban areas with the old system which does not have the capacity to carry the whole quantity of water, especially during storms, which results in the flooding of some neighbourhoods.

The treatment of waste water started in the late 1970s, but no great achievements had been accomplished until the late 1980s when the authorities, aware of the situation and committed to preserve the environment, initiated major projects to build new treatment plants and expand the capacity of the old ones. In 1995, the number of treatment plants reached 48 units, having a total capacity of 423,000 m³/day and treating 87% of the collected waste water.¹ Other plants are being built or are planned to be built.

Lagoons are being used as primary treatment for the waste water in some coastal cities (Tunis, Rades, Sfax, Jerba), while secondary treatment (activated sludge) is adopted at most of the other treatment plants. The sludge produced during the treatment process is in most cases treated by anaerobic stabilisation before final disposal. Oxidation with chlorine is also applied as bacteriological treatment.

The effluents from the treatment plants (without treatment as well) are discharged into the sea, lakes, lagoons and other receiving bodies. Except for three of the sea outfalls (Hammamet, Sousse and Jerba), all other discharge points are located close to shore, in shallow waters, with low dilution rates which result in the contamination of the receiving waters with heavy metals and an increase of nutrients. The Gulf of Tunis is the most affected area because it receives 63% of the total treated waste water and because of the current and wind conditions.²

Industrial waste water, if it is not discharged into the public sewer, goes directly to the receiving body (sea, lakes, rivers). In the industrial area of Ben Arous 470 of the 574 industrial institutions are not connected to the public sewer, consequently they are

discharging their wastes directly or indirectly into the southern Lake of Tunis.³ The study, carried out by the Ministry of the Environment, shows that 30 of those institutions have a high level of contamination in their waste water requiring special treatment.⁴ In this respect a treatment plant serving those institutions is required. The same study shows that 103 other less polluting institutions can be connected to the public sewer with simple pre-treatment, while the other 337 institutions can be directly connected to the public sewer without any treatment.⁵ Many other industrial areas have similar problems (Bizerte, Nabeul, Sousse), but the main problem of industrial waste water is associated with the chemical industries (phosphate processing) in Sfax, La Skhira and Gabes where the untreated effluents are carrying 12,000 tons of gypsum to the sea every day.⁶ The authorities have decided to put an end to this practice and they are examining the possibility of discharging these wastes on land. This solution will not be without an environmental effect on the underground water table unless adequate measures are taken to prevent the infiltration of the contaminated water which is difficult and costly to ensure. Now the potential for such a mistake is reduced because a rigorous Environmental Impact Assessment has to be carried out prior to implementing such a decision.

Storm water in urban and industrial areas is a big environmental problem for two reasons, one, because it carries many pollutants, especially from the industrial areas, and two, because it reduces the efficiency of the treatment plants during the rainy season since all the treatment plants use an overflow system to bypass the huge flow of rain water into the public sewer system. Storm water needs to be collected separately and more care must be given to some industrial areas where such water can be some highly contaminated, requiring special treatment before discharge into a receiving environment.

An approach to reuse the treated water (23% in 1995) for irrigation purposes has been adopted.⁷ About 6400 hectares of agriculture (fruit trees, cereal, tobacco and cotton) and sport (golf) fields are being irrigated with treated waste water.⁸ This approach has been widely criticised by environmentalists for its eventual impact on human health, but is regarded by the authorities as the solution to the depletion of the fresh water

resources. Attempts are also being made to reinject this water into the ground to maintain the water table. This has to be rigorously monitored to prevent any eventual contamination of a vital natural resource.

3.1.4 Management of solid wastes in the coastal zone

The local authorities have to deal with 1.3 million tons of solid wastes annually (about 1 million of which are in the coastal zone).⁹ Until recent times there was no clear strategy for the management of those wastes. Municipalities were assigned the responsibility of collection and disposal of the household wastes, while industrial wastes were left to the industries to be handled without control from the authorities. In fact, until 1996 there were no regulations for the management of solid wastes and the private sector was totally excluded from this field. The result was the use of large inland areas, for the disposal of the urban and industrial solid wastes, in most cases close to the inhabited areas or to the coastline, which constituted a real threat to public health and a permanent disturbance to the marine environment.

In the last few years measures have been taken by the authorities to remove some of those disposal areas away from the cities and the receiving environment. This was the first attempt to reduce the pollution by solid wastes. There is still a long way to go before the problem of solid wastes can be solved. With the existing management system and the current behaviour of the citizens, it is difficult to overcome the problem. The amount of garbage generated individually is increasing rapidly and the types of wastes are changing for the worse because of the tendency of people to rely more and more on packaged and chemical products. Disposing of the wastes in remote open areas is not the solution, that is a simple transfer of pollution from one place to another and a delay in the environmental effects. Industrial wastes are becoming more and more dangerous and their management needs more care.

The newly enacted law dealing with the management of wastes, pays special attention to dangerous wastes. All activities in connection with the management of dangerous wastes are subject to the authorisation of the Ministry of the Environment, but good management practices are difficult to apply in the absence of the basic infrastructure

to handle those wastes. Public hospitals are required to have their own facilities for the treatment of their wastes, but the private sector (doctors and pharmacists) are still using the public facilities. Other activities taking place in the urban areas (car repair, house painting etc.) are also using the public facilities for the disposal of large quantities of dangerous wastes (batteries, oil filters, paint tins, etc.).

The recycling of wastes is still at its beginning and a small proportion of solid wastes is being recycled, mainly paper and plastic. Few companies have become involved in this industry despite the different incentives provided. The lack of an adequate sorting system for the urban wastes and the characteristics of wastes (high level of moisture) are the main obstacles for the development of an efficient recycling industry which is not likely to change in the next few years. An insignificant amount of metals (copper and lead) is being recycled in a traditional way. The steel factory, Elfouledh, is the main industry involved in recycling metals (steel) but this industry is not interested in the 43,000 tons of metals (3.36% of the garbage) going annually to the landfills. It deals mainly with industrial wastes produced in large quantities. This industry could be used to develop a scrap industry and get rid of a number of ship wrecks grounded along the coasts.

The economic value of the garbage has not been considered yet. Apart from the use of wood wastes as fuel in some traditional activities, no other benefits are taken from the wastes. On the contrary a lot of money is being spent to handle those wastes (34 dinars/ton), and a lot of land is claimed for the disposal of those wastes.¹⁰ This situation has to be changed to find a substitute for fossil energy and to cope with the increasing demand in energy bearing in mind that the national underground reserves of oil and gas are very limited and are expected to be exhausted in two or three decades.

An integrated system for the management of solid wastes (household and industrial) is needed to protect the environment and preserve natural resources. Reducing the production of wastes is the first step. It is the responsibility of the citizen (the

consumer). Industries can contribute by reducing the production of wastes, by reducing their by-products and by providing less polluting products.

Reusing some products is the second step; it is the responsibility of both the consumer and the producer. The producer can help by producing a competitive reusable product. Recycling is the third step, and it is the responsibility of the industries but cannot be done without the co-operation of the citizens. Recyclable material can be separated by the citizens at home and collected by the industries who must provide adequate facilities for the storage of different types of wastes. A mutual trust has to be built up between the two parties to overcome existing difficulties and cut down the costs of the recycling process. The citizen (the consumer) should be encouraged to use products made from recycled material, which is basic to promote a recycling industry.

The problem of final disposal is much more complicated and needs more care from the authorities. Compacting wastes can help in saving the land required for disposing of wastes but it does not solve the entire environmental problem. Hazardous wastes have to be treated in proper ways. Incineration can be an ideal solution for organic wastes and a lot of energy can be recovered from such wastes. In some countries (Sweden and Denmark) the treatment of solid wastes has become a profitable industry.¹¹

With new technologies the results are encouraging and the environmental problem in connection with the exhaust gases has been overcome. Such an approach has to be considered for a city like Tunis, which handles about one third of the country's total amount of municipal and industrial wastes. The landfilling of wastes cannot be totally avoided as there is always something left from the incineration process, and some things are not possible to incinerate. Therefore, adequate landfills have to be provided, with their location and management subject to assessment for eventual environmental impact.

3.1.5 Situation of the reception facilities in national ports

Being party to MARPOL 73/78, Tunisia is required to provide adequate reception facilities for all kinds of ship generated wastes in all its commercial ports, an obligation that most countries do not meet. Fishing and pleasure ports also have to be provided with reception facilities to help the fishing and pleasure boats comply with the provisions of the Convention. This burden is left to the port authorities responsible for the management of the different ports and who are not able to bear the costs to provide these reception facilities.

In the two major oil handling ports (La skhira and Bizerte), the oil industry had to provide the reception facilities for the ballast water and oily residues and charges were made to ships for the use of these facilities. In terms of availability and capacity, those facilities can be considered adequate, but the treatment ability is limited to the separation of water and oil by a simple settlement process. For this reason contaminated wastes are not accepted.

Sludge and oily wastes from the machinery spaces are supposed to be discharged to mobile facilities provided by private operators and authorised by the port authority. These services are not available in all ports for many different reasons. It needs to be considered by the authorities how to get private investors involved in this activity and to ensure the availability of this service in all ports. One of the reasons that the collection of oily wastes is regarded as unprofitable is due to the high costs of the required equipment and the low frequency of the activity in a single port. The other major problem is absence of storage and treatment facilities for oily wastes in the vicinity of the ports and the difficulties encountered to deliver those wastes to the single treatment operator (the oil refinery in Bizerte). In this respect, port authorities need to regard providing a solution to the problem as part of their responsibilities and try at least to provide the storage facilities in all commercial ports.

Garbage is handled in all ports by private operators, who have found in the collection of ship generated garbage a profitable activity. The charges fixed by the Maritime Authority, in common agreement with the port authority, are considered reasonable

(50 to 70 dinars/ton). Viewed from the ship's perspective, this looks perfect. This approach meets the requirements of the convention from the environmental point of view, but it does not rationally solve the problem and achieve the goal of protecting the environment. In the absence of an adequate system for the management of solid wastes, this approach represents a simple transfer of pollution from sea to land. The garbage collected from ships is disposed of in the traditional way in the open areas used for the disposal of domestic wastes, which increases the load on the local authorities. This practice has to change to comply with the new national regulations related to the management of wastes and many difficulties are expected in respect to whether restrictions will be put on the acceptance of the kinds of ship generated garbage, as defined in annex V of MARPOL 73/78.

The import of some kinds of wastes, and the mixing of dangerous wastes with non dangerous wastes are no longer allowed by the new regulations. Recognising that a ship's operational wastes could often contain some unidentified dangerous wastes means that these wastes need to remain segregated. Handling ship's wastes can lose its profitability if the operators have to comply with the requirements of the regulations related to the collection, transport and disposal of wastes. In this respect, the port authority has to be ready to respond to such a situation in co-operation with the local authorities to ensure the continuity of these services. It must be mentioned that ships calling in national ports are required, before they leave, to discharge to shore all garbage they have on board using the services of the waste operators.

Sewage from ships is not handled at any of the national ports. It is supposed to be handled by the private operators, but in the absence of national or international legislation in force to prohibit the discharge of the sewage into the sea, nobody is willing to use the onshore service. The service is available in the form of mobile tanks already used by private companies to deal with domestic cases. Except for the port of Bizerte-Menzel Bourguiba, the collected sewage can be delivered to a treatment plant in the vicinity of the port.

The other kind of ship-generated wastes requiring reception facilities according to Annex II of MARPOL 73/78 is the noxious liquid substances in which many national ports are involved. None of the national ports provide reception facilities, simply because as discussed before, none of them are handling a category A product and because the Mediterranean Sea is not considered as a special area. This can be a handicap to ships entering a national port for loading purposes having some category A wastes in their tanks. The same applies to ships entering a shipyard that need to wash tanks having contained category A substances.

Nothing is specially mentioned about reception facilities in fishing or pleasure ports by the provisions of MARPOL 73/78, although it applies to fishing and pleasure vessels. That was considered as a national issue and left to be dealt with by the national authorities. Marine pollution by oil and garbage from fishing vessels is a reality in Tunisia, but it has not been brought to a level of concern by the authorities and remains overlooked.

None of the over 40 fishing ports is fitted with reception facilities for oily wastes or for garbage. The national agency responsible for the management of these ports did not feel the need to provide facilities because none of the fishing vessels retains its wastes on board to be discharged to shore. Technically, none of the existing ships is able to retain these wastes onboard, and even the new ships are being designed and built without taking into account this issue. International and national regulations prohibiting the discharge of wastes at sea are totally ignored by the fishermen. This is not an excuse for not having reception facilities in fishing or pleasure ports. Reception facilities must be there as a first step towards the implementation of the regulations, the second step will be the familiarisation of people with their use.

It is not possible to directly charge fishing or pleasure boats on the basis of the use of reception facilities, because they will refrain from using them, but reasonable fees can be included in the port dues. The authorities responsible for the management of fishing or pleasure ports can collaborate with the municipal authorities or the private operators to provide the required facilities.

3.2 PREPAREDNESS AND RESPONSE STRATEGY

Preparedness for the response to marine pollution emergencies is not a new issue. It has been addressed on many occasions and by many global and regional treaties. States were required to adopt national strategies to respond to marine pollution accidents affecting their waters and to co-operate and assist each other in large emergencies. For Tunisia, this issue is not so old since the first steps towards the establishment of its response strategy were made in the early 1990s; the national contingency plan is still in a stage of development. This strategy can be discussed and analysed at three different levels, regional, national and local.

3.2.1 Regional co-operation in responding to marine pollution

The principal of regional co-operation for the response to marine pollution was adopted in the Mediterranean Action Plan by the Mediterranean States in 1975. The framework was also put in place by the adoption in 1976 of Protocol 2 to the Barcelona Convention concerning co-operation in combating pollution of the Mediterranean Sea by oil and other harmful substances in cases of emergencies, and the establishment of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) in Malta. Such a framework is extremely necessary in a sea area like the Mediterranean Sea where 2,000 tankers and 350 million tons of oil are annually moving in and out, and where the eco-system is very sensitive to any oil pollution accident.

The Malta Centre was assigned the objectives:

- to facilitate co-operation among the member states, co-ordinate their efforts in combating marine accidental pollution and to communicate the required information; and
- to assist member states in developing their own response capabilities, especially in setting up their national contingency plans.

It is obvious that REMPEC is not directly involved in operational activities, it has no equipment or means for the response to marine pollution emergencies; it only gives technical advice and co-ordinates the mutual assistance. The Centre organises seminars

and training courses for the people dealing with emergency situations in different countries of the Mediterranean Sea. The Centre also collects, updates and provides information about accidents occurring in the Mediterranean Sea, and identifies companies dealing with emergencies and products to be used in combating oil spills.

Tunisia seems not to have benefited from any of these capabilities in developing its national contingency plan or in training its staff. The reason might be the failure of that Centre, and the whole programme of the Mediterranean Action Plan to provide the financial assistance for the implementation of the different programmes. Tunisia found in the Global Environment Facility (GEF) the solution to its financial problems, to enhance its response capabilities and develop its national contingency plan.

A pilot project for Oil Pollution Management, involving three of the south Mediterranean countries, Tunisia, Algeria and Morocco is supported by GEF and the World Bank. It is now going on, and has for objectives:

- the enhancement of oil spill response capabilities in the three countries and the development of national and regional contingency plans;
- the provision of pollution monitoring mechanisms;
- the provision of equipment for combating oil spills;
- training of national and regional staffs; and
- the rehabilitation and expansion of reception facilities at key ports to receive oily ballast water and bilge waters.

The project is at an advanced stage now; the training programme for the different categories of staff was successfully carried out with the technical assistance of French expertise. As a result Tunisia could have the legal framework of its contingency plan adopted in 1996.

The first indicators of success of the project have attracted the two other countries of the south Mediterranean coast, Libya and Egypt. They expressed, in 1995, their interest in joining the regional project. The five countries agreed during the conference held in Cairo in December of 1995, to expand the project to a wider regional effort to save the Mediterranean from oil pollution, and they have presented their proposal to

the GEF which approved it in August 1996. Since that time a steering committee has been working to finalise the different components of the new project. Tunisia will benefit from this wide project by reaching an agreement with Libya to co-operate in the case of an emergency in the border area, which is the most exposed to the threat of marine pollution by oil and hazardous materials because of the intensity of the traffic of these products in that area.

The question now is: What is the impact of this project on REMPEC ? Probably, the five countries will lose some interest in REMPEC, but the latter will not be affected and will continue its mission as the co-ordinating and advisory body on a larger scale. It is expected to give its support to the regional project by providing the required data on different matters related to oil spill response. REMPEC is supposed to be dealing with harmful substances emergencies which are not provided for in the new regional project, so it is expected to be helpful in the case of emergencies involving such materials.

3.2.2 National Contingency Plan for marine pollution emergencies

The first attempt to establish a national contingency plan for the response to major disasters was made six years ago, when the Law n.91-39 of 8 June 1991 was enacted, related to prevention, response and rescue in cases of major disasters. It provided in Article 2 that national and local plans for the prevention, response and rescue in case of disasters, must be established. A national permanent commission in charge of the development and the implementation of the national plan needs to be established under the supervision and authority of the Interior Minister, and another local permanent committee in charge of the development and implementation of the local plan, under the supervision and authority of the Governor, has to be established in each governorate (Art. 3). These plans are initiated by the Interior Minister at the national level and by the Governor at the local level.

According to the definition of the disaster in article 1, a major marine pollution incident is considered as a disaster and has to be dealt with in this framework. The provisions of Article 5 require the Governor to establish and update the inventory of

the equipment, human resources and institutions available, but this requirement has not been sufficiently regarded. Small oil pollution incidents have shown the inadequacies and the lack of co-operation and experience of the system.

On the third of April 1996, Law n.96-29 was enacted, establishing the national contingency plan for response to marine pollution emergencies, and putting in place the legal framework for its implementation. The plan was the output of the regional pilot project discussed earlier. It went beyond the objectives of that project by covering all kinds of marine pollution as provided in Article 2 of the above law. It provided also in Article 3 that the national contingency plan applies to marine pollution accidents occurring in all the waters under national sovereignty or jurisdiction and to the areas of the high sea in cases of imminent threats to the marine environment and the national coastline. Here we find Tunisia exercising its rights provided in international law to intervene in the area of the high sea to remove the threat of marine pollution and protect its interests, but nothing was mentioned about the consultation of other states involved in the accident (flag state or coastal state).

International assistance, in case of a major marine pollution accidents beyond the national capabilities, affecting the national waters and coastline, is dealt with in Article 23. The national commission for the prevention and response to marine pollution accidents was assigned the responsibility of facilitating mutual assistance between states party to the related global and regional conventions. Again, and apart from the alert that has to be sent to the neighbouring country which is likely to be affected by a pollution accident (art.11), nothing is mentioned about eventual assistance to other states experiencing similar difficulties or Tunisia's obligations under the South Mediterranean Contingency Plan.

The objectives, the general organisation and the operational element of the national contingency plan are the main contents of the enacted law.

a. The objectives: The main objectives of the national contingency plan as defined in Article 2 are:

- identification and analysis of the risks and their impact on human health and on the environment;
- identification of the responsibilities of the public authority and other participants in the preparedness, response and support actions;
- attribution of the roles to the different parties involved in preparedness, response and co-ordination; and
- establishment of the procedures for an effective use of resources and efficient response to emergencies.

b. The general organisation : A national commission on the prevention and response to marine pollution accidents, headed by the Minister of Environment, has to be established, having for its functions the supervision and the implementation of the national contingency plan. This commission is entitled to decide on the methods and measures to be taken in dealing with marine pollution. It also has to establish and update the inventory of all response means, and to ensure their availability in the appropriate location taking into account the vulnerability of the different areas.

The other functions assigned to the national commission on the prevention and response to marine pollution accidents are: the development, in co-operation with the different authorities concerned, of education and training programmes for the people involved in the response operations, and the development and maintenance of the documentation related to the contingency plan.

At the local level, a committee headed by the Governor has to be established for the implementation of the national contingency plan. The Minister of Environment, head of the national commission, is the national co-ordinator, who initiates the contingency plan. The Governor of the region involved in the pollution accident, is automatically designated as local co-ordinator, reporting to the national co-ordinator the evolution of the situation on a regular basis and conveying the different decisions and recommendations to the operational staff. When the accident involves more than one governorate the Interior Minister designates the local co-ordinator.

It was provided that an alert system, involving the different authorities operating at sea, must be established. The alert message has to be sent directly to the head of the national commission on the prevention and response to marine pollution accidents.

c. The operations: This part defines the functions and responsibilities of the three key positions in the national contingency plan, the General Command Centre (GCC), the Offshore Command Centre (OCC) and the Inland Command Centre (ICC), which has to be put in place as soon as the contingency plan is initiated.

The persons, respectively in charge of the GCC and the OCC, are designated by the national co-ordinator (the Minister of Environment). In the case of a marine pollution accident likely to affect the coastline, an ICC is installed and a person in charge of it has to be immediately designated by the local co-ordinator (the Governor).

The GCC is assigned the responsibility:

- to take the appropriate decisions related to the operational strategy;
- to decide on the intervention techniques, the equipment to be used and the areas to be protected; and
- to co-ordinate between the different participants, especially the OCC and the ICC.

Both the OCC and the ICC are assigned the responsibilities:

- to receive and execute the instructions of the GCC;
- to organise and conduct the intervention operations applying the adopted techniques;
- to supervise the response teams;
- to report to the GCC the evolution of the operations; and
- to record the different actions taken and the use of equipment, supplies and resources.

The end of operations at sea or onshore is decided by the national co-ordinator on the proposal of the GCC and on the request of the on-scene command centre concerned (OCC or ICC). At the end of the response operations, the national co-ordinator has to prepare a dossier of compensation for the damages suffered by the Tunisian state. Such

a dossier is presented to a commission of experts designated for the purpose. Private claims are also included in that dossier.

Following a marine pollution emergency involving the national contingency plan, a final report has to be made by the national commission on the prevention and response to marine pollution emergencies, including:

- A description and evaluation of the damage suffered by the marine environment and the coastline and an evaluation of the costs of recovery of the damaged areas;
- An identification of the total costs of the response and cleanup operations; and
- An evaluation for the implementation of the national contingency plan.

Although it looks well developed, this contingency plan has some weaknesses related in particular to the alert system and the evaluation of the accident prior to the initiation of such a plan. Sending the alert message directly to the head of the national commission on the prevention and response to marine emergencies, has the disadvantage of isolating the local authorities from the phase preceding the initiation of the contingency plan which affects their preparedness and reduces the effectiveness of the response.

Nothing was mentioned about the evaluation and assessment of the accident which is the key element for the initiation of the national contingency plan and the first step following the alert message. This evaluation will draw the line between the national and local contingency plan; local authorities must be able and enabled to make this first evaluation and judge whether they can locally handle the situation or not. Communication with the media and the public was also ignored. This can result in inadequate coverage of the event and unreliable information communicated to the general public.

3.2.3 Local contingency plan for the response to limited marine pollution accidents

Time is the main factor to be considered in responding to emergencies. The first minutes or hours are the most critical regarding response operations. This has been

proven in cases of oil spills at sea where the quick change in weather and sea conditions often significantly affects the effectiveness of the response strategy. Convinced of the importance of the role of the person on the scene of the accident to minimising its effects, merchant ships were required, under the provisions of MARPOL 73/78, to carry on board a shipboard oil pollution emergency plan (Annex I, Regulation 26), defining the action to be taken immediately by the persons on board to reduce or control the discharge of oil following an incident. The same thing was decided for offshore platforms, oil terminals and the commercial, pleasure and fishing ports, all addressed by the national regulations related to contingency planning (Art.22). All those institutions have to develop a specific contingency plan for responding to limited marine pollution accidents in the port area or in the area surrounding the platform. These plans have to be approved by the Ministry of Environment and must include a training programme for the personnel involved in the response operations.

The relationship between the national contingency plan and the local ones was not defined; neither was the role of the local authorities in the specific plans, or the eventual co-operation and co-ordination between the different institutions in the same area. The oil industry has made a step ahead in concluding agreements for mutual assistance in case of pollution accidents and two clubs, grouping offshore companies, refinery, oil distribution companies and other institutions concerned, have been established for this purpose.

3.2.4 Other elements to be considered in the National Contingency Plan

There is a long way to go before the national contingency plan can be effective; the top organisation has to be complemented by a clear definition and distribution of the roles to the different parties involved in the plan. In order to make the best use of the available resources, priorities have to be established in the response strategy according to the different scenarios of possible accidents. The main sources of risk and the main areas at risk have to be identified in advance. The response technique to be adopted will depend very much on the sensitivity of the environment and the national response capabilities.

a. The main sources of risk: The threat of marine pollution comes from two different directions; the domestic activities, and the international traffic of oil and hazardous material.

At the domestic level, the threat of oil pollution comes from an eventual accident (grounding or collision of tankers) during the transport of crude oil or products along the coast, or from a mishandling accident during loading and unloading operations, or from an accident involving offshore activities. All the coastline, from Zarzis to Bizerte, is subject to this threat with more pressure on the areas around La Skhira and Bizerte, the main oil terminals.

Chemical substances are mainly handled in the ports of La Skhira, Sfax and Gabes, so this risk is concentrated in the Gulf of Gabes.

At the international level, the threat lays in the region of the strait of Sicily, where 4 to 5 laden oil tankers pass every day through the traffic lanes of Cap Bon in Tunisia's territorial waters. The north coast is also under the threat of oil pollution from all types of ships due to the heavy weather during most of the year. The north coast has a record of high incidences of ships grounding.

b. The main sensitive areas: To determine the sensitivity of an area, three factors have to be taken into account; the geomorphology of the coastline, the characteristics of the ecosystem and the socio-economic value of such an area.

Except for the north coast, from Tabarka to Bizerte, which is mainly rocky, with a considerable ability for self cleaning, and preserved from human activities, all the rest of the coastline is relatively very sensitive to oil pollution. The major part of the east coast is sandy beaches with shallow waters, the most sensitive areas being those having high human activities, tourism and industries (Bizerte, the Gulf of Tunis, the Gulf of Hammamet, Sousse, Monastir and the Gulf of Gabes). Other areas are also very sensitive because of their unique ecosystems, being already declared as specially protected areas (Zembra and Zembretta islands).

c. The response techniques to be applied: Three different techniques can be applied when responding to an oil pollution incident on the water; onsite burning, chemical dispersion or mechanical recovery. The adoption of one of these alternatives depends on the size of the spill and the sensitivity of the area. The weather conditions and the properties of the spilled oil are also important factors to be considered.

Having identified the main sources of risk and the main areas vulnerable, priorities can be established for the best allocation of the response capabilities. In the present situation, to cope with the lack of capabilities of mechanical recovery of spilled oil, the protection of the sensitive areas (aqua-culture, ports, industrial units and tourism areas) must be considered as a first priority; therefore, equipment for the containment of spills and the protection of such areas (booms) has to be available in the proximity and ready for prompt use. Equipment for onsite burning of oil also needs to be available. The eventuality of adopting such an alternative should not be overlooked because it can prevent a major spill from reaching the coastline; but to be successful, it has to be decided on early in the response to the accident.

The use of dispersants is an inevitable option in many cases due to the size of spill or the weather conditions, so a scientific research in support of preplanning efforts needs to be carried out to evaluate the appropriate use of dispersants in the different scenarios.

Ex. 1, 2, 3

d. Training of personnel: The human factor is the heart of contingency planning. Besides providing the organisation, knowledge and experience are also required in dealing with emergencies. People involved in the implementation of the contingency plan have to be trained on a regular basis to keep them up-dated and familiar with the different response techniques and equipment. Simulation exercises on a large scale that involve large numbers of participants, including the general public, should be carried out from time to time. These are most useful in evaluating the adequacy of the national contingency plan.

Special attention must be given to the preparedness for, and response to, accidents involving hazardous materials. The threat is imminent in the area of the Gulf of Gabes, where important chemical activities (production, storage and transport) are taking place. So far Tunisia has not had any accidents, but it is always possible and capabilities to respond to such accidents are limited. The reactions of people are also unpredictable, which may make the situation more difficult than in the case of an oil spill where the general public are not expected to be frightened by the possible need for evacuation.

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CONCLUSION AND RECOMMENDATIONS

The first conclusion of this investigation is the picture that can be drawn of the marine environment in Tunisia, showing the main sources of environmental disturbance, the actual state of the marine environment and the conflicting activities in the coastal zone.

Regarding the sources of marine pollution, it appears that Tunisia is primarily suffering from a chronic problem of municipal and industrial pollution. The discharge of untreated effluents into the sea and the discharge of solid wastes in uncontrolled landfills in the coastal areas are responsible for the degradation of sea water quality. Other activities such as fishing, maritime transportation, offshore oil production and tourism are also responsible for chronic marine pollution. The contribution of accidents to marine pollution is at present negligible, but the risk of an oil spill from an oil tanker or offshore platform accident is extremely high in some areas.

At first glance, the state of the marine environment does not look so bad, but looking more closely there is clear evidence that many areas are completely degraded and many others are threatened. The Gulf of Gabes is at the top of the list of degraded areas: erosion of the coastline due to industrial port infrastructure and destruction of the fauna and flora due to the discharge of industrial wastes and fishing practices are readily discerned.

The coastline around Jerba island is severely eroded because of the tourism infrastructure on the beaches. The marine area around Sfax has experienced degradation of water quality and destruction of sea grass due to urban and industrial wastes being discharged into the sea.

The Lake of Tunis (south) and the nearby sea area has degraded water quality due to eutrophication and erosion of beaches arising from the discharge of urban and industrial effluents. Another degraded marine area lies near the city of Bizerte, including the Lake of Bizerte: Severely degraded water quality exists due to the discharge of untreated urban and industrial effluents.

More than 100 km of coastline (Tabarka, Nabeul, Hammamet, Sousse, Monastir, Kerkennah) are under the threat of pollution and erosion because of the pressure exercised by the tourism industry and the related activities. The coastline from Tabarka to Bizerte is the only area preserved from human activities.

Many conflicting activities are taking place in the different marine areas along the coastline. Developing activities such as industry, fisheries, tourism and transportation exist at the same time in the same areas. The gulf of Gabes is again the theatre for most of the conflict, with chemical industries in the north-west part, tourism industry in the south, offshore oil and gas industry in the north-east, in addition to three commercial ports and 50% of the national fishing industry. The other area of conflicts is the Gulf of Hammamet where offshore oil activities are being developed in an area having over 25% of the tourism industry.

The institutional framework for the management of the marine environment seems to be well addressed but it is not without weaknesses. The Ministry of Environment, with its specialised agencies has taken over all responsibilities for environmental issues; this has the advantage of providing a single and comprehensive environmental strategy, but it has the disadvantage of excluding many institutions, that deal with some aspects of the environment, from being directly involved in the decision making process. The Ministry of Environment was assigned the responsibility to co-ordinate all such institutions and collaborate with all industries. This is not easy in the present situation because of traditional vertical paths of communication that are applied in all governmental institutions. The implementation of the environmental policy depends on those institutions which are dealing with environmental issues in their day-to-day work.

In this respect it is recommended that the role of those institutions should be strengthened by establishing a special environmental organ (department) in each, responsible for the implementation of the national environmental policy and coordination with the Ministry of Environment and other similar organs in other institutions. This would serve to build a strong national environmental network that can integrate the application of environmental policy throughout the government.

Regarding maritime transportation, the role of the Maritime Administration (DGMM) should be strengthened by establishing a Directorate for Marine Environment responsible for the implementation of the national policy and the international regulations related to the protection of marine environment. The Maritime Administration, official representative of the State in IMO meetings, should be more active in its participation, to defend the national interest and bring the national concerns to a higher international level. The environmental issues have to be brought to the same level as safety and economic development issues in order to meet the requirements of sustainable development. The Maritime Administration should also improve its capabilities in the field of Port State Control and accident investigation to contribute effectively to the protection of the national waters from ship source pollution.

The legal framework for protection of the marine environment looks like a puzzle with some pieces missing; the national legislation is of the type "one size fits all" which results in divergence in the interpretation of the legal texts. The lack of subsidiary regulations to define and clarify the meaning and the application of some provisions, leads to the ineffectiveness of the application of those provisions.

In this respect it is recommended to review, update and complement the national environmental legislation and to group it within a single comprehensive code. The intent is to provide a tool in the hands of the judicial and administrative authorities to implement and enforce the national policy, and to be a guide for companies and individuals to know and understand their duties towards the environment.

Special attention should be paid to the international environmental conventions to which Tunisia is a signatory. Effective implementation should be pursued by the adoption of subsidiary regulations and the continuous revision of the national legislation to comply with those international instruments and their related amendments.

Marine living resources do not seem to be managed in a sustainable manner; fishing permits are granted with respect to social factors and short term benefits. The related regulations cannot be effective unless a scientific study is carried out to determine the levels of the fish stocks and the total allowable catch for the different regions and species to ensure that the maximum sustainable yield is not exceeded.

The management of the marine environment reflects many deficiencies in the approaches adopted to deal with the different sources of marine pollution. Despite the efforts made by the authorities to raise public environmental awareness, the general public does not seem to be ready to take part in the fight against the degradation of its environment. Hopefully, the younger generation is reacting positively to the needed environmental protection actions, which allows us to be optimistic about the future.

Nevertheless, the current situation can be improved by getting the older generation involved in the environmental issues related to their professional areas and by involving the general public in the EIA process through public hearings for the projects that have potential for national impact. The NGOs should change their policy, join their forces and come closer to the citizens to pass their environmental message. The various concerns for the environment should be included in school programmes at all levels. Maritime education and training institutions, including those dealing with fishermen, should emphasise the legal, scientific and technical aspects of preventing and responding to marine pollution.

The management of urban liquid wastes (sewage) can be considered to be on the right track, but there is still room for improvement. It is recommended that effluents should be discharged into deep waters, out of lakes and away from the bathing areas. It is

recommended also to provide a separate system for the collection of storm water to improve the effectiveness of the sewage treatment plants.

The management of industrial waste water is one of the deficiencies of the environmental policy; untreated effluents continue to be discharged into the sea, lakes, lagoons or in the public sewer. Treatment plants are too expensive to be afforded by most industries. The principal of "the polluter pays" has not helped to solve the problem, nor has the cleanup fund (FODEP) had the positive result intended. The authorities should take appropriate measures to build such treatment plants in the major industrial areas and help other smaller industrial activities to acquire the necessary treatment equipment.

A large monitoring network for marine pollution, covering the whole coastline is required to detect the changes in water quality to give warnings to the authorities to enable them to act in time.

Reception facilities in ports need to be provided by the port authorities in their development plans. The attitude towards the wastes generated by the fishing fleet has to be changed and serious action needs to be taken to eliminate the marine pollution caused by such wastes.

With regard to preparedness for environmental emergency response, it can be said that there is still a long way to go before being ready to respond to a major accident, considering the present capabilities and experience levels. All the efforts made to build the regional co-operation network, and all the money spent to acquire the equipment may be useless if the right strategy and mechanisms are not developed for the optimal use of existing resources. Besides relying on regional co-operation, Tunisia should develop its own national response capabilities. The shortage of response materials, equipment and resources can be addressed by the proper management of existing national assets and human resources.

A cadre of highly skilled response personnel should be the main element of the response strategy. It is recommended that a National Strike Team should be established to respond to major marine accidents involving oil spills and hazardous materials; this would provide the advantage of cutting down costs of training people for different regions and institutions, and would ensure the readiness of full time personnel qualified to respond to all kinds of emergencies in all areas. The success of a such team depends on well established logistical planning and an alerting system, which are the weaknesses of the existing contingency plan. The national army with its two branches, the Navy and the Air Force, is in a good position to carry out this mission since it has the basic required infrastructure. The response centre could logically be located in the area of Cap Bon, which is an area of high risk of oil pollution due to the intensity of the maritime traffic. The establishment of a National Strike Team would not eliminate the need for the local response teams which are still needed for small, local incidents within their capabilities.

This location would be suitable to serve both the east and north coasts. It is recommended also to install in the same area a Vessel Traffic System (VTS) to track the movement of vessels which should use a traffic separation scheme in this region. The VTS would reduce the risk of accidents and facilitate the task of the response team by enhancing the alerting system and by providing the required information about any vessels involved in an accident.

Now, looking at this picture of the marine environment in Tunisia, and at Principle 1 of the Stockholm Declaration 1972, which says that "Man has the fundamental right to adequate conditions of life, in an environment of a quality that permits a life of dignity and well being, and he bears a solemn responsibility to protect and improve the environment for present and future generations," the question is, "Does man in Tunisia enjoy his environmental right and is he fully bearing his responsibilities?" If the answer is not directly given in this study, it can be easily deduced from what was presented. What should be said here is that there is no right without duty. The protection of the environment is a big responsibility which has to be shared by everybody, individuals and organisations. All should identify their role and give their

contribution to ensure that the 21st century is an environmental century, and a precious gift for future generations.

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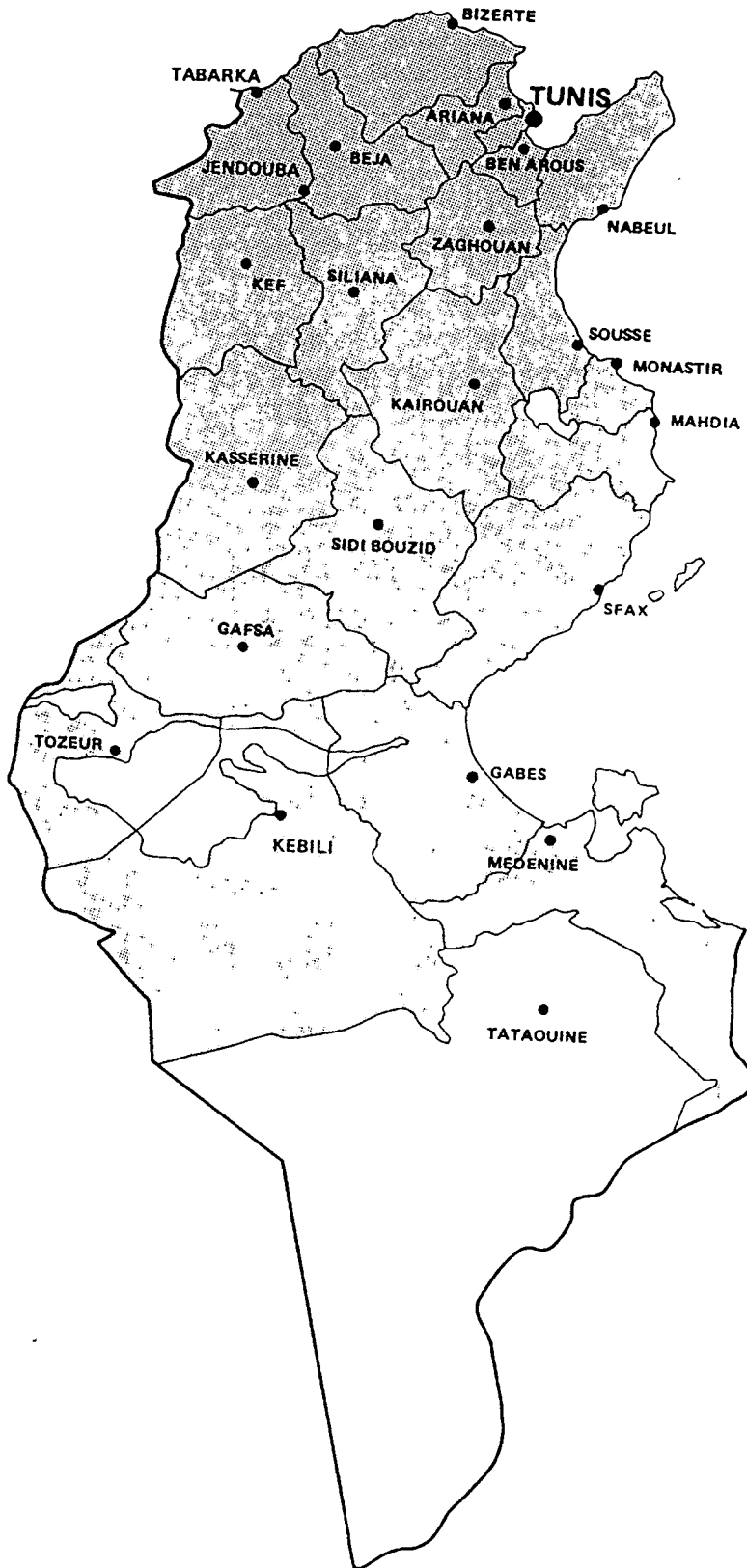
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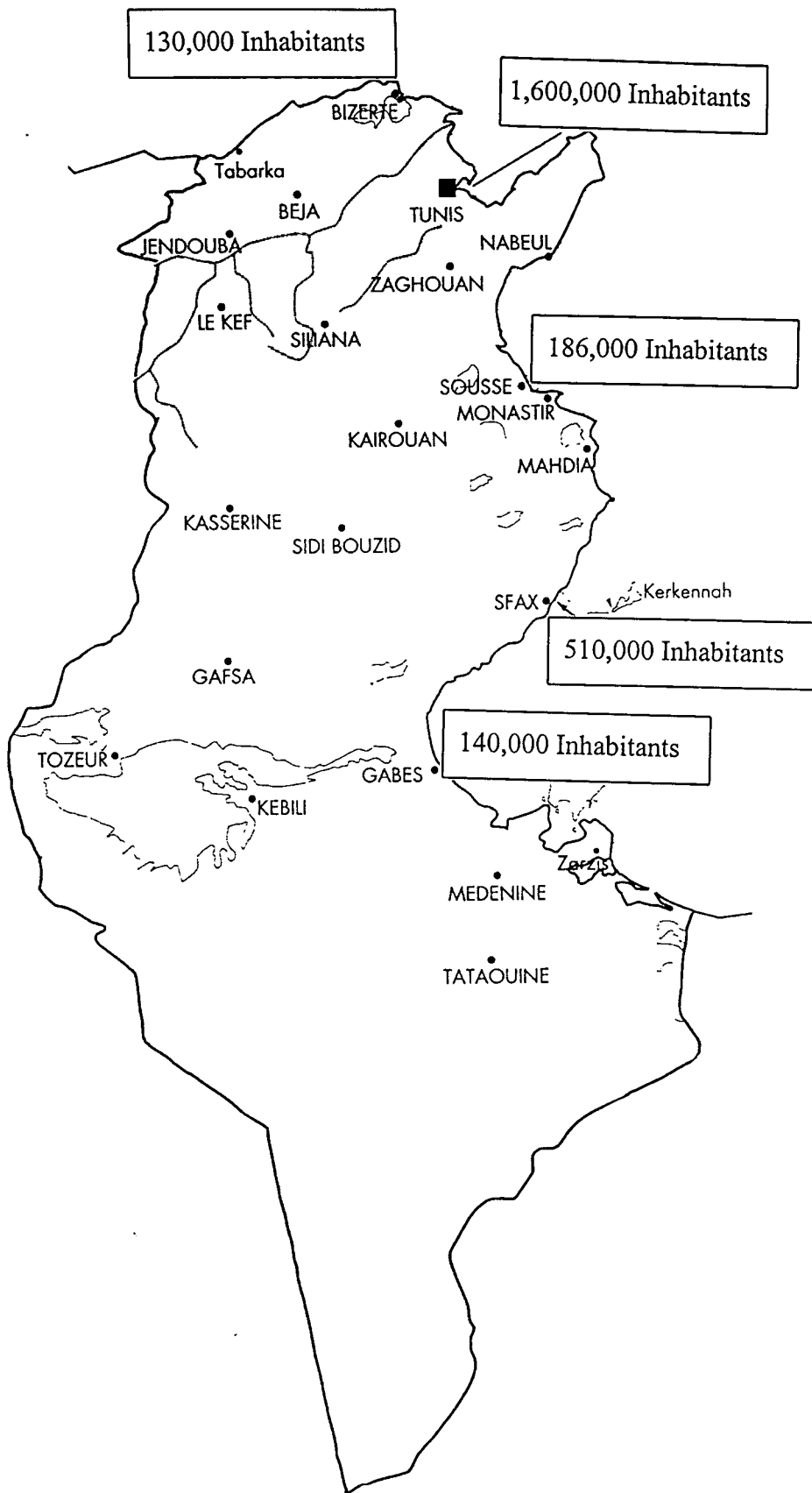
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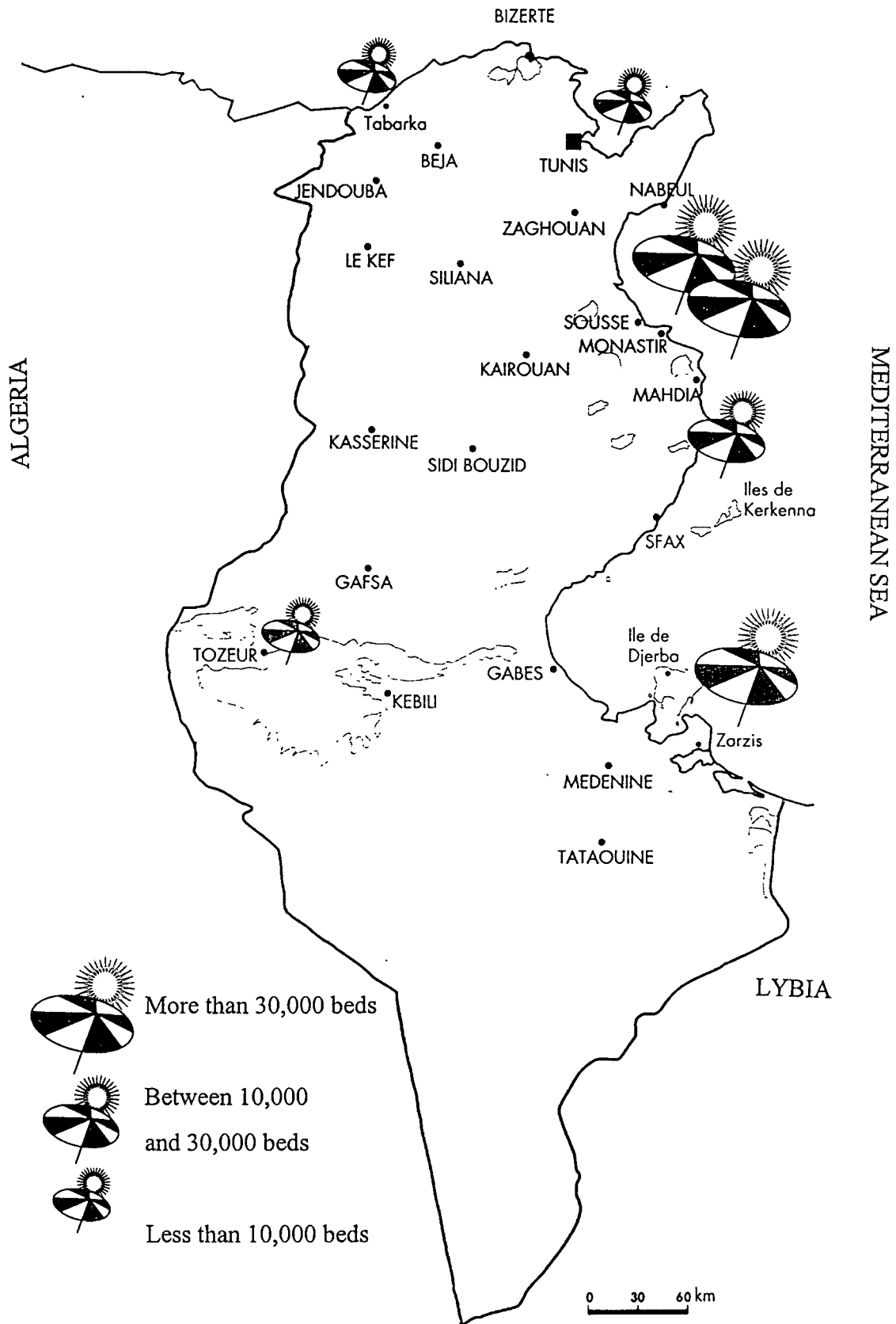
APPENDIX 1
Administrative Map of Tunisia



APPENDIX 2
Urbanisation in the Coastal Zone

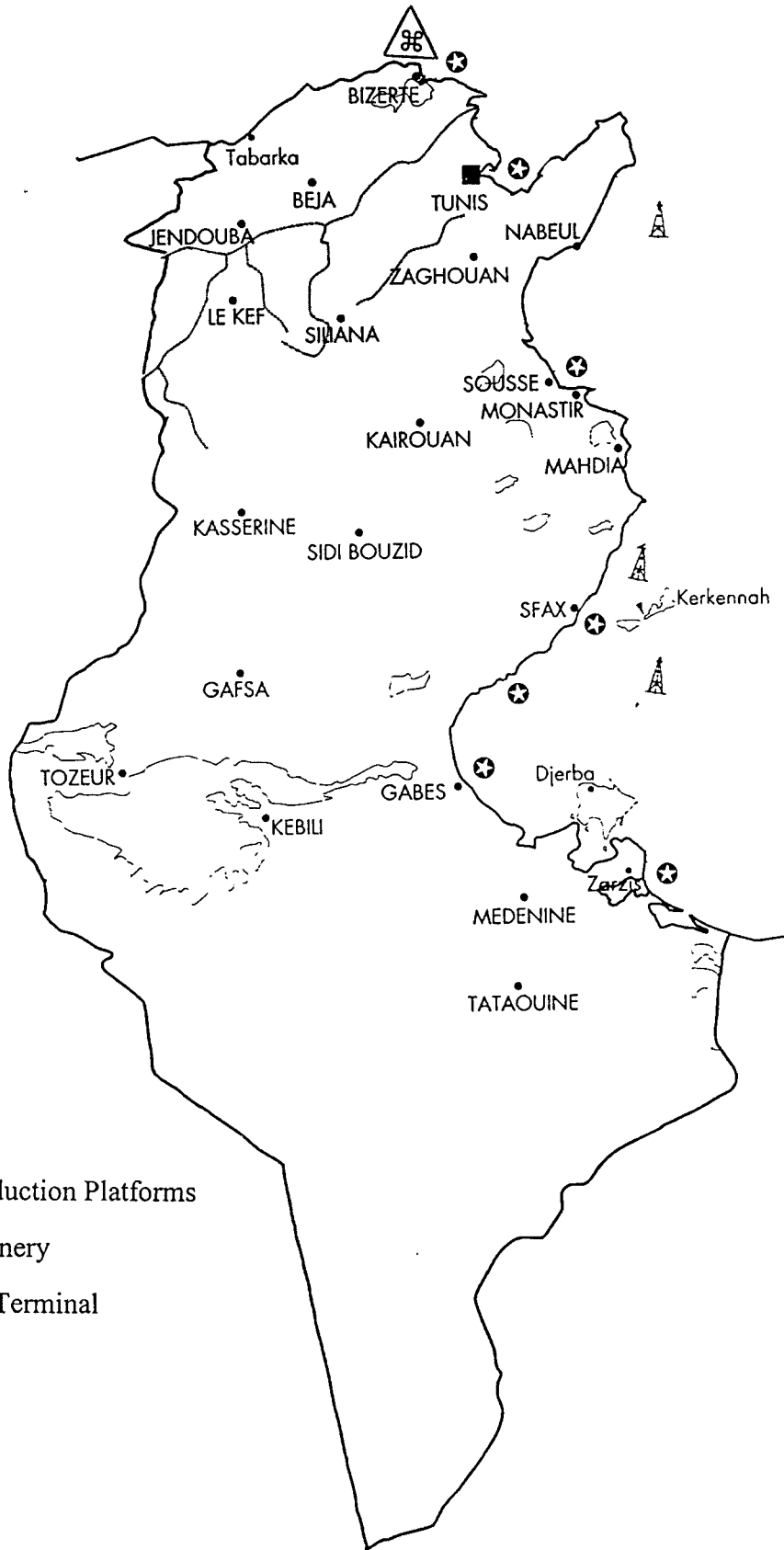





APPENDIX 3
Tourism in the Coastal Zone



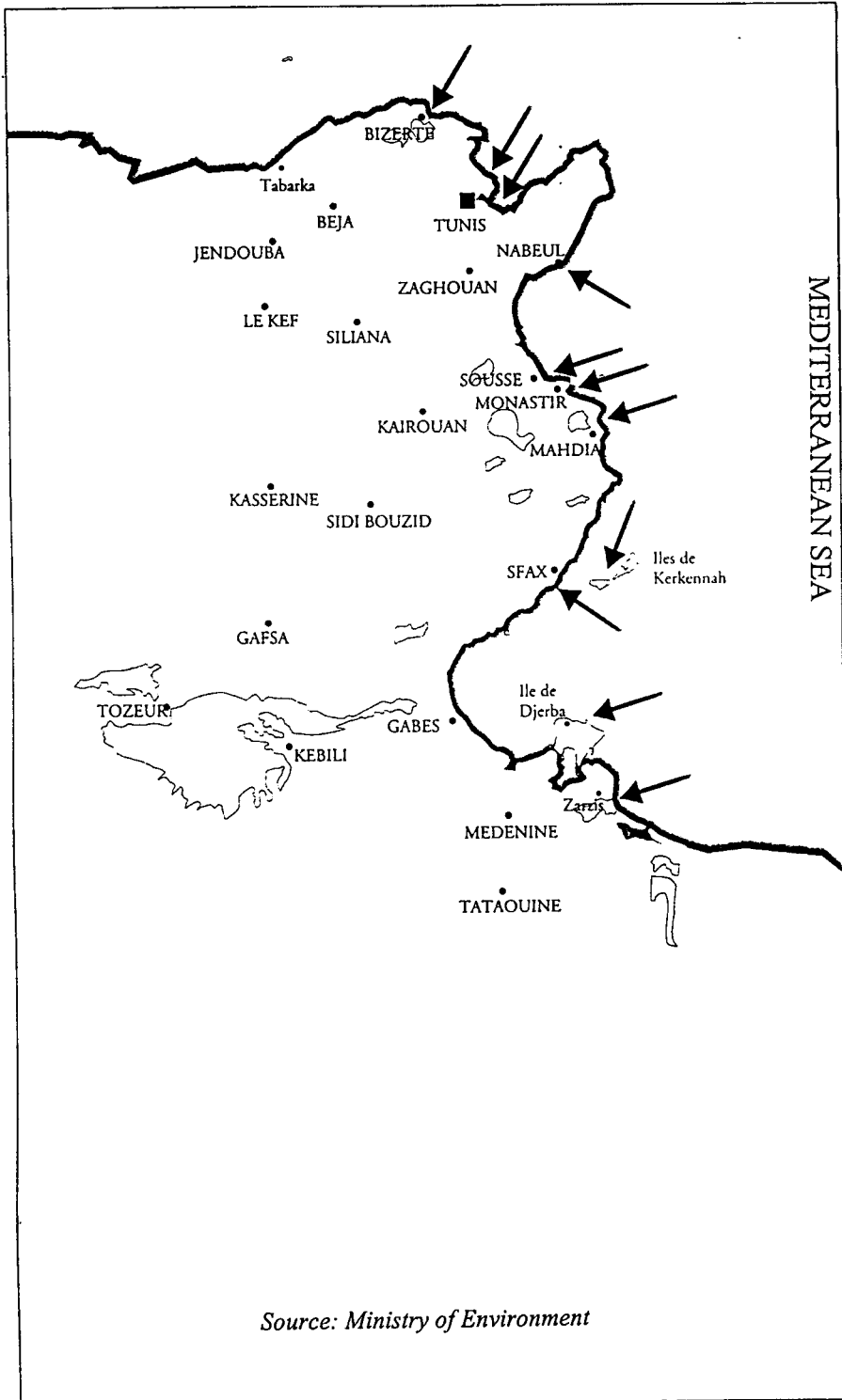
Source: Ministry of Environment

APPENDIX 4
Oil industry along the Coastline



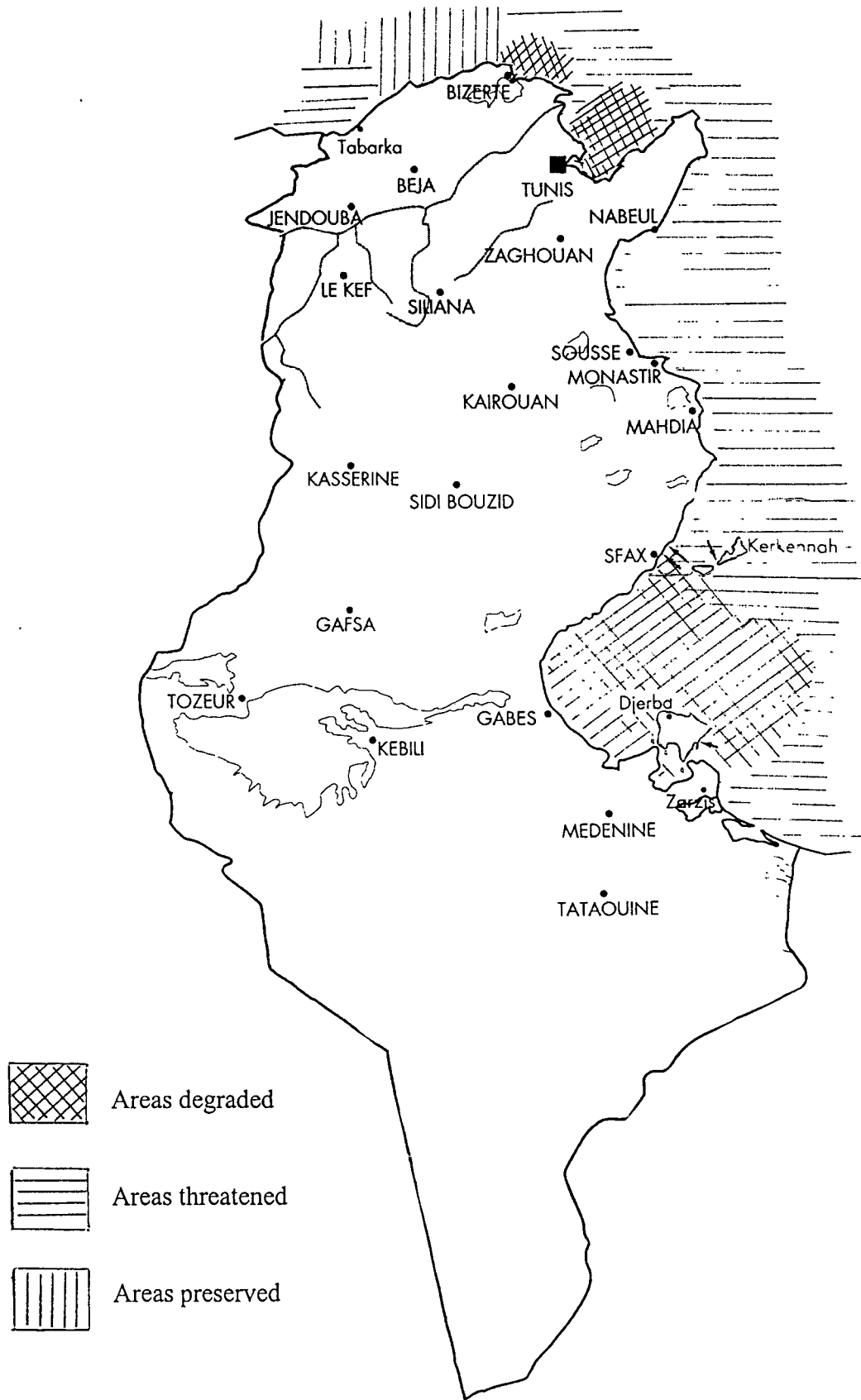
-  Production Platforms
-  Refinery
-  Oil Terminal

APPENDIX 5
Erosion of the Coastline



APPENDIX 6

State of the Marine Environment



APPENDIX 7

Conflicts in different uses of the sea

