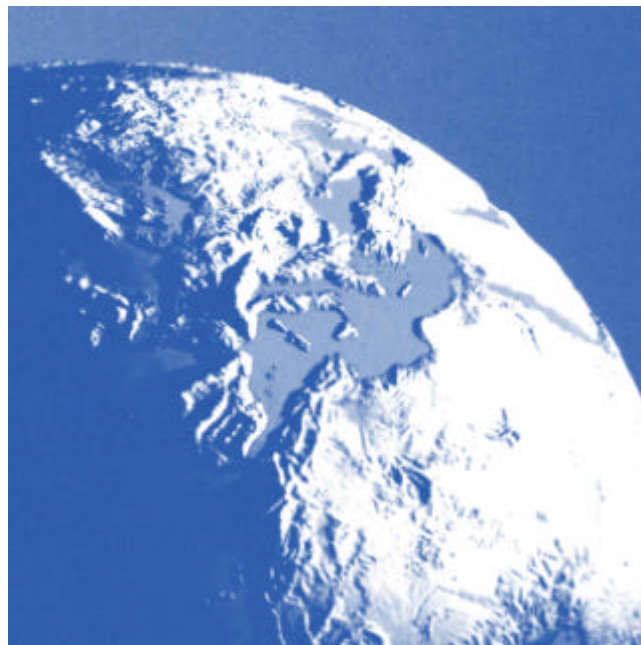




MEDITERRANEAN COUNTRY PROFILES

TUNISIA

Environment and sustainable development issues and policies



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Note

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Contents

FOREWORD	II
1. TUNISIA	1
Population.....	1
Economic context	3
Political and administrative context.....	4
2. MAJOR ENVIRONMENT/DEVELOPMENT ISSUES... ..	7
Soil resources	7
Water resources	9
Vegetation resources	12
Desertification	15
Biological diversity	19
Ecosystems and sensitive areas	21
3. ...AND MAJOR DEVELOPMENT/ENVIRONMENT ISSUES.....	26
Urbanisation and "coastalisation".....	26
Urban development	31
Rural development.....	33
Agriculture and fisheries	36
Tourism, a driving economic sector	38
Industry and management of industrial pollution	39
4. MAIN STAKEHOLDERS	43
Public environmental institutions	43
Society and environment	46
Partnership and international co-operation	47
5. CROSS-SECTORIAL POLICIES AND ACTIONS.....	51
Planning and land-use planning.....	51
Environmental legislation and regulations	53
The National Commission for Sustainable Development (CNDD).....	56
National action programme for environment and development	58
Other tools for sustainable development	60
ACRONYMS AND ABBREVIATIONS.....	62

Foreword

The Blue Plan scenarios, published in 1989¹, showed that the protection of the Mediterranean Sea, its shores and coastal regions, could not be achieved through action carried out on the sea or on the coastal regions alone. On the contrary, it depended mainly on the overall development, environment and physical planning policies followed by the Mediterranean countries at the national level. “ Decisions on the bulk of environmental protection will be made (or not) largely at the level of the state. Essential legislation and standards will have to be established at this level, as well as the necessary mechanisms and institutions with the financing and competence to apply them...”. *The Blue Plan* then invited the neighbouring countries to change direction and undertake deliberate policies based on an effective implementation of physical planning and on the preparation of national and regional environmental protection plans, along with objectives and deadlines.

Since then, environmental policies are expanding in the Mediterranean countries. In line with extended efforts since the Earth Summit in 1992, and whereas economic or land-use planning show some decline, environmental plans, together with institutional, regulatory and economic tools, are being drawn-up or implemented in more than half of the neighbouring countries. Initially aimed at restoring degradation, environmental policies are presently searching more and more to integrate the ecological concerns into a sustainable pattern of development.

Within the framework of its Observatory mission under the aegis of the Mediterranean Action Plan, and with the European Commission's support (GD XI, Life Programme), the Blue Plan has made efforts over several years to follow up these changes in the countries. From this work the *Mediterranean Country Profiles* were born, the objective of the series being to know better and to communicate the great diversity of situations in the basin. The first Country Profiles concerned Albania, Turkey, Tunisia and Morocco (1995), Egypt (1996), Algeria (1998), and were mainly focused on the emerging environmental institutions at the national level.

The series has progressively evolved from a descriptive approach at the beginning to a more analytical one at present. Senior national experts carry out the analysis in close co-operation with the Blue Plan. Each country report provides an overview of a country's key environmental, societal and developmental issues and challenges. Underpinned by a sustainable development perspective, the purpose is to identify the priority issues in a given country and to better understand the existing and evolving conditions for implementing environmental policies or for integrating the ecological concerns into development and sectoral policies. The Lebanon Country Profile published in 1999, illustrated this new approach.

Mr. Ahmed Souissi was given the responsibility of preparing this new Profile of Tunisia. Mr. Souissi worked as a pedologist at the Tunisian Ministry of Agriculture, where he was then the head of the Soils Directorate (1965-1991), and at the Ministry of the Environment and Land Use Planning as a consultant. He has also carried out numerous consultancies in environment and natural resources for FAO, UNDP and the World Bank.

In the preparation of this report, Mr. Souissi benefited from contributions of other Tunisian experts. For the completion of the final document, the Blue Plan has benefited from the remarks and comments of Mr. Mohammed Adel Hentati, Director of the Regional Activity Centre for Specially Protected Areas, and former Director for Conservation of Nature and the Rural Environment of the Ministry of the Environment and Land Use Planning.

The main data in the Tunisia profile come from Tunisian reports on the state of the environment over the last five years, from the summary report on biodiversity, from the national action plan to combat desertification, and from the national land use planning scheme, published by the Tunisian Ministry for the Environment and Land Use Planning.

¹ GRENON Michel, BATISSE, Michel (editors). *Futures for the Mediterranean Basin. The Blue Plan*. Oxford University Press, 1989; *Le Plan Bleu. Avenirs du bassin méditerranéen*. Paris: Economica, 1989.

Data collection for the preparation of this profile ended at the beginning of 1999. The French version was published in 2000.

It is hoped that the Mediterranean Country Profiles series will contribute to improve mutual understanding and work toward strengthening co-operation for the environment and sustainable development in the Mediterranean Basin.

Guillaume Benoit,
Director of the Blue Plan

1. Tunisia

Tunisia is bordered by Libya in the south-east, Algeria in the west, and has a shoreline on the Mediterranean to the north and east. Tunisia's surface area is of 164,000 km², its coastline totals 1,300 km, its average altitude is 700 m and its highest point is the Jebel Châambi (1,540 m).

The climate is Mediterranean, ranging from humid in the extreme North to desert-type in the extreme south. The climatic and geomorphologic characteristics define three major agro-ecological zones:

- The **North**, constitutes a sylvo-agricultural region (mainly forests and annual crops); its average rainfall is between 400-600 mm and its main topographic features are mountain pasturelands in the north-west and fertile plains in the north-east.
- The **Centre**, constitutes an agro-pastoral region (pasturelands and crops); its rainfall is between 200-400 mm, and its morphology is composed of a low steppe to the east with fertile plains interrupted by depressions and a high steppe with mountain pasturelands and plains.
- The **South**, with irregular rainfall of 100 to 200 mm, is characterised by its aridity and vulnerability of its soils to desertification. This area is pastoral with oases around water points.

The total population of the country is 8.8 million inhabitants (1994 census) with 61 % living in urban areas and 39 % in rural areas. The natural growth rate is 1.9 % (1994). Education has always been a priority sector, with a primary school enrolment rate of 100 %. Although the illiteracy rate is still high, it is decreasing progressively. Health standards have much improved as witnessed by the drop in infant mortality from 127‰ in 1970 to 42‰ in 1994.

In geopolitical terms, Tunisia has a strategic position enabling it to be part of several areas - Euro-Mediterranean, Maghreb, Arab-Muslim and African. Tunisia is the first south Mediterranean country to have signed (1995) an association agreement with the European Union (EU).

Moreover, Tunisia continues to work for the construction of the Arab Maghreb Union, which not only revives a historic common past but also offers a framework in which to better adapt to international situations. Within all these international mutations, Tunisia affirms its membership of the African continent and the Arab World.

The country's natural environment, characterised both by the scarcity and the fragility of its water, soil and vegetation resources, is facing the growing needs of an increasing population. Strategies and programmes have led to increased and diversified production, often accompanied by the overexploitation of resources resulting in their degradation.

The population has doubled over the last 25 years. During this period, the rapid evolution of the agricultural sector was accompanied by important development of the economic sectors (industry, tourism and transport) and by urbanisation. All this resulted in a more intensive use of space with impacts on the environment (increased pressure on natural resources and ecosystems, pollution....).

POPULATION

Over the last 50 years the rate of demographic growth can be characterised as follows: after an acceleration between the 1950s and 1970s, the rate of demographic growth declined at the beginning of the 1980s due to a marked decrease in the overall fertility rate. This decline can be attributed to the efforts made to promote the status of women (higher marriage age, women schooling, participation to economic activity, and family planning).

Related policies were implemented in three phases:

- In the 1960s the status of women was established and the family planning programme was launched;
- In the 1970s family planning was strengthened through the creation of the National Family and Population Office (Office National de la Famille et de la Population);
- In the 1980s population and development policies were integrated.

The family planning policy (birth control) pursued over 30 years is the main contributing factor to declining fertility. Likewise, mortality rates have decreased due to efforts since the 1960s to improve health cover and to combat epidemics and contagious diseases. The mortality rate fell from 15 ‰ in 1966 to 8.7 ‰ in 1976, 6.4‰ in 1986 and 5.9 ‰ in 1996.

Life expectancy rose from 51 years in 1966 to 71.4 years in 1996. All these results are due to investments for basic infrastructure, for equipment of dispensaries and local hospitals (1 centre per 5,448 inhabitants in 1992; 1 centre per 5,000 inhabitants in 1996), and for improved health cover (1,800 inhab per physician in 1991 and per 1,500 inhab/physician in 1995).

Moreover, the social policy undertaken by the State which aimed at improving housing, infrastructure development, and more specifically providing drinking water and electricity, have greatly contributed to social development and the overall improvement of living conditions.

Development of population according to latest censuses

	1956		1966		1975		1984		1994
Population (x 1000)	3,783.2		4,533.3		5,588.2		6,966.2		8,785.4
Annual growth rate (%)		1.8		2.3		2.5		2.3	
Overall fertility rate							4.64		2.87

Demographic growth has fell below 2 % in 1990 to reach about 1.7% at present. Projections show that this trend of decreasing growth rate should be maintained (to about 1.3 % in 2005, 1.1% in 2015 and 0.9 % in 2030).

The population's spatial distribution is characterised by several factors: the concentration of 1/5 of the population in Tunis; the increasing weight of towns and coastal areas where development factors concentrate and diversify; intensified migration from the North-west towards coastal regions, without resulting however in a decline in total numbers.

Urbanisation is increasing very rapidly and the urban population now represents 61% of the national total. If urban concentration generates risks of pollution, on the other hand it reduces pressure on natural resources in rural areas.

Rural population should decline from 3.425 million in 1994 to 3.4 million in 2000, 3.3 million in 2010 and 3.1 million in 2025. This contraction of the rural population will probably take place in the less favoured mountain areas, with a reduction of resources overexploitation (tillage followed by erosion, deforestation etc.)

Urban development is generally accompanied by a reduction in agricultural land area on the outskirts of urban centres located in the fertile plains (Northern suburb of Tunis, Jendouba, Souk El Khémis, Mornag). The annual uptake of agricultural land, about 2,000 ha/y in 1996, will increase to 3,000 ha/y in 2010. Moreover, the urban growth will result in increased drinking water consumption, which will reduce the supply of good quality water for agriculture.

Urban expansion has given rise to anarchic housing especially on the outskirts of towns, with impacts in terms of quality of life, space consumption, management of solid and liquid wastes, etc.

ECONOMIC CONTEXT

With the 9th economic and social development plan (1997-2001), Tunisia starts its fifth decade since independence in 1956 and enters the 21st century with the objective of raising its economic and social development to the competition level imposed by globalisation, whilst ensuring the upgrading of all sectors.

The favourable economic context of the last decade favoured improvement in the Tunisians' social level (education, health, and poverty alleviation). GNP per capita increased by 4.3 %; and will reach 3,170 Tunisian Dinars (TD) in 2001 (as compared to 2,070 TD in 1996).

Statistics for 1984 and 1994 show that an average of 53,500 jobs were created annually and that the proportion of employed persons with secondary education rose from 25 % to 36 %. Employment developed at the same rate as demographic growth during the 1989-1994 period and the unemployment rate of 15.5 % remained stationary.

Job creation during the 7th and 8th plans reached 204,000 and 284,000 respectively and is forecast to reach 320,000 under the 9th plan.

During the 8th Plan the real average GDP growth was of 4.6 % per year owing to the development of the manufacturing (6.5 %) and services (6.3 %) sectors.

Evolution of GDP (in %)

Sectors	Annual average: 7 th Plan period (1987-91)	Annual average: 8 th Plan period (1992-1996)	Forecast of annual average: 9 th Plan period (1997-2001)
Agriculture and fisheries	4.02	-1.2	4.3
Manufacturing industry	6.23	6.5	6.9
Non-manufacturing industry	-0.16	3.6	4.4
Services	5.84	6.3	7
Total	5.84	4.6	6.0

Exports increased by 6.3 % a year during the last five years; import coverage went from 89 % in 1991 to 96.6 % in 1996. All sectors participated in the improvement of this increase in exports excepting the energy sector where exports dropped from 10.1 % in 1991 to 7 % in 1996.

State budgetary policy tends to reduce the deficit, which was brought down to 5.9 % of GDP in 1991 and to 3.5 % in 1996. Debt remains high, accounting for 51.4 % of state revenue in 1996.

Price movements have been contained to an average annual increase of 4.8 %, which has sustained the national products *vis-à-vis* competition. The average inflation rate during the 8th Plan is estimated at 3% (1996).

Encouraging results on the social level have been achieved during the last decade; purchasing power has doubled and the quality of life has considerably improved (rural electrification increased from 29.3 % to 63.7 % whilst access to drinking water rose from 49.4 % to 68.3 %).

The National Solidarity Fund (Fonds de Solidarité Nationale "26-26") constitutes an original example in the field of poverty reduction (see Chapter 3). It was set up during the 8th Plan to meet the needs of impoverished areas and promote employment as well as building of infrastructure to improve the quality of life.

The 9th Plan (1997-2001) was prepared on the basis of world, regional and local economic trends. Main guidelines are: increased opening-up of the economy to the outside world and reinforcement of the private sector, conformity with sectoral orientations, reinforcement of infrastructure, enhancement of human resources, social development, increased regional development.

POLITICAL AND ADMINISTRATIVE CONTEXT

Tunisia's political-administrative context is defined by the Constitution of 1st June 1959 as a presidential republic.

Legislative power is exercised by the people through a representative assembly, the Chamber of Deputies, elected for a 5-year mandate, and formed by 163 members elected by direct universal suffrage. Since the March 1994 election the legislative assembly has become pluralist: members now belong to five different parties.

The Chamber of Deputies adopts constitutional, organic and ordinary laws with the absolute majority of its members; it empowers the President of the Republic for a stated period for a given purpose to issue decree-laws which must be submitted to the Chamber at the end of this period; it votes the budget. The Chamber, along with the President of the Republic, has the initiative to propose laws.

Executive power is exercised by the President of the Republic assisted by a government co-ordinated by the Prime Minister. The President of the Republic is the head of state; he is elected for five years by direct, free and secret universal suffrage. He can be re-elected twice. He guarantees national independence, the integrity of the nation and respect of the constitution and national laws as well as the implementation of treaties. He monitors the regular functioning of constitutional public authorities. He promulgates treaties as well as constitutional, organic and ordinary laws

The President of the Republic appoints the Prime Minister and other members of the government. He presides over the Council of Ministers. He terminates the life of the government or functions of one its members on his own initiative, or on the proposal of the Prime Minister.

The President of the Republic also exercises general regulatory power and can delegate all or part of it to the Prime Minister. He can submit to a referendum any draft law concerning the organisation of the public authorities or tending to ratify a treaty which, without going against the constitution, would have an impact on the functioning of the institutions.

The Prime Minister co-ordinates the activity of the government; when appropriate he takes the place of the President of the Republic in presiding the Council of Ministers or any other council.

The government, comprising the Prime Minister and Ministers, is responsible to the President of the Republic for its management and sees to the application of State policy in conformity with guidelines and options defined by the President.

The judiciary power. In conformity with the provisions of Article 64 of the constitution, judgements are given in the name of the people and carried out in the name of the President of the Republic. In the exercise of their functions, magistrates are only subject to the law. They are appointed by decree on the proposal of the Senior Council of the Magistrature.

Amongst consultative organs, the Council of State (consisting of two organs, the administrative tribunal and the court of audit) oversees the conformity of the administrative acts with the law, and of the public financial operations with budgetary and legislation rules. The Economic and Social Council *vis-à-vis* the legislative and executive powers, sees to the continuity and mutual consultation between socio-professional groups about the economic and social policy of the government. The Constitutional Council watches over the constitutionality of laws. The constitutional law adopted by the Chamber of Deputies in October 1998, conferred a mandatory character on the opinion of the Constitutional Council for all arms of government. Finally, the Higher Islamic Council examines all questions submitted by the government, relative to the application of the first article of the constitution and those relating to the social area and the Muslim doctrine.

On the administrative level, Tunisia is now divided into 24 governorates, which are sub-divided into 254 delegations in turn divided into 2,044 sectors (Imadas). These administrative units are respectively headed by designated governors, delegates and sector heads (omdats).

The Regional Development Councils manage the governorate affairs; they are presided over by the governor and are composed of deputies, mayors, presidents of rural consultative councils (established in main rural population centres to manage local affairs), as well as technical services which are part of ministry departments.

There are 257 communes² managed by municipal councils whose members are elected. The mayors are designated amongst council members.

² The 'commune' is a restricted territorial area, generally urban, where a municipality is established by decree which places it under municipal regulation.



2. Major environment/development issues...

SOIL RESOURCES

Tunisia faces a number of convergent natural and anthropic factors, which account for the fairly advanced level of soil degradation. The main problems are water and wind erosion, and salinisation. The great challenge is to contain these problems whilst preserving the productive potential of the land. Preventive actions aimed at the rational management of land must be combined with curative actions to enable land improvement, rehabilitation and restoration through adequate management. This is the major stake of sustainable soil management, and can only be achieved through the preparation of a favourable context. The latter requires an appropriate institutional environment, organisation of the population, reorganisation of land ownership, and financial means to undertake the priority conservation measures to reverse degradation.

State of resources, threats induced by their use

The combination of Tunisia's varied bioclimate, ranging from humid to Saharan - and its geology offering different types of rock outcrops -, generates a fairly rich variety of soils. The soils are well differentiated by their fertility and sensitivity to degradation. Three major regions can be distinguished by the nature of their soils and the related cultivation systems.

Northern Tunisia, a region with a sylvo-pastoral potential, has highly diversified soils:

- acid soils on alternating clay and sandstone, non calcareous, shallow but quite rich in organic matter and relatively stable, occupied by Zeen oaks and cork oaks forests, the most degraded of which are formed under scrubland;
- deep calcareous soils on marl slopes very sensitive to water erosion;
- shallow soils on calcareous rock, located on tops of hills and on the encrusted fans of foothills;
- deep, stable and fertile soils of numerous more or less extended plains.

All suffer severe water erosion enhanced by slope cultivation and tillage, by overgrazing, and by inadequate rotations of rain fed and irrigated crops where the integration of animal husbandry is virtually absent. The failure to recycle organic matter (manure, straw...) accentuates the impoverishment of soils in humus and leads to their physical and chemical degradation.

Soils of irrigated plains risk chemical degradation - salinisation - due to irrigation with brackish water without sufficient drainage to leach out the salts.

Central Tunisia is an agro-pastoral region dominated equally by the heavy soils of alluvial plains, which are mostly sodic³, by the sealed skeletal calcareous soils of the large fans and by the deep and light soils, which were in the past occupied by rich pastures. These different units are confronted with several problems: the expansion of tree cultivation on the sandy steppes which triggers wind erosion; the cultivation of natural and esparto grass pastures which leads to the reduction of pasturelands, and as a consequence to overgrazing; the excessive development of irrigated agriculture using degraded water derived from overexploited aquifers, which leads to the secondary salinisation of soils.

Southern Tunisia has a pastoral vocation and is characterised by arid, light soils vulnerable to wind erosion, dominated by the presence of gypsum. Olive growing and cereal cultivation in the southern steppes are the cause of desertification of the natural pastures; these by deflation become stone deserts, and by accumulation, sand dunes.

In the three major regions, belonging to the sub-humid, semi-arid and arid zones, soil degradation is mainly due to human activity since land use (1995) does not correspond to soil aptitude. An

³ sodic: halomorphic in the original text

estimated more than one million hectares of marginal lands are cultivated, and a large proportion of sandy soils, which are vulnerable to wind erosion in arid areas, are tilled.

Land cover

Type of use	Surface (1000 ha)
Cultivated land of which:	4 774
– fertile soils	3 020
– barely fertile soils	1 754
Forest areas (forests and maquis)	831
Pasturelands	4 706
Water bodies and humid zones	393
Desert areas and miscellaneous	5 282
Total	16 415

Source: Inventaire forestier et pastoral national, 1995

As a matter of fact, the usable agricultural area covers almost a third of the national territory, but fertile land does not account for even 20%. More than 60% of the usable agricultural land is in arid areas where soil is in a precarious balance, threatened by water and wind erosion.

Between 1980 and 1994, arable areas remained stationary, as did areas reserved for various speculative activities.

Erosion and desertification threaten the sustainability of soil resources. Annual soil losses are estimated at 23, 000 hectares, of which 13, 000 ha cannot be recovered.

Land suitable for cultivation in the north and centre of Tunisia, located north of the 200mm isohyet, are most threatened by strong and moderate erosion while the Centre-East and Cap Bon are somewhat less threatened. In total 1.2 million ha are affected by water erosion, representing 25 % of the nation's land suitable for cultivation. In the South, an estimated 50 % of the land, not included in natural deserts, faces desertification (accumulation of sand, surface scraping).

All anthropic degradation factors (ploughing of marginal lands, unsuitable land use, continued degrading farming practices, agro-sylvo-pastoral imbalance) together with those of natural origin (heavy rains, violent winds, favourable orographic conditions) combine into a synergistic impact resulting in the degradation of soil resources.

Soil conservation measures and prospects

Soil water conservation (SWC) measures have always been a major concern for farmers in arid areas both in Tunisia and elsewhere. The most impressive traditional SWC works are the "Meskats⁴" of the Sahara, the "Jessours" of the Matmatas and the "M'gouds" in the Kairouan plain. These traditional works, built and managed by farmers themselves, have fully demonstrated their efficiency.

Since 1960, through the General Directorate for Forests (Direction Générale des Forêts -DGF) followed by the Directorate for SWC in 1983, the State has undertaken SWC activities treating over 1 million hectares of land. During the 1960s, social SWC (to create jobs) prevailed; in the 1980s focus was made on land use planning, and on development during the 1990s, under the new national SWC strategy for 1990-2000.

Investments allocated rose from 2 million TD⁵ in 1979 to 5.54 million TD in 1987, 26.4 million TD in 1991 and more than 40 million TD in 1996. During the 8th Plan, expenditures on SWC works amounted to 222.8 million TD. The 9th Plan (1997-2001) provides for an allocation of 243.9 million TD or more than 48 million TD/year.

What emerges from these 38 years of SWC is the precariousness of the work undertaken; an analysis of all the anti-erosion works completed shows that in the long run, their durability and

⁴ Meskats : shallow basins are dug to collect runoff; Jessours : small dams in gullies to collect upstream water and soil for use in agriculture; M'gouds : works to spread floodwaters.

⁵ TD : Tunisian dinars

upgrading cannot be ensured solely by a planning approach. SWC works are accepted only when they bring direct benefit to farmers.

The national soil and water conservation strategy (1990-2000) tries to correct the deficit of non-participation of the population. The efforts include major involvement of beneficiaries in the management of works, the strengthening of monitoring and evaluation procedures, the reinforcement of technical assistance, as well as the adaptation of the projects to farmers and production systems.

This strategy provides for the rehabilitation of nearly 1 million hectares by the protection of slopes, mobilisation of surface runoff, maintenance and safeguard of works.

The estimated cost of these activities, at 1990 constant prices, is 562 million TD. These costs do not concern the accompanying measures (studies, research, training, dissemination, awareness-raising), which are undertaken by the specialised services of the Ministry of Agriculture.

The direct effects of the anti-erosion works are perceptible, especially after major rainfalls when a real improvement can be assessed; the frequency of large floods has decreased everywhere, in the north and centre of the country. Furthermore, yields have increased on land where SWC measures were adopted.

WATER RESOURCES

Increased water needs due to economic and social development have led Tunisia to draw up an increasingly precise inventory of its resources and to put in place an important infrastructure for collecting and transferring water.

Water master plans and strategies (the 1990-2000 and the "Eau 2000" strategies) underline the challenges that Tunisia must assume in order to ensure its water needs for sustainable socio-economic development. These are essentially:

- rational water demand management through the maximum use of available resources within the limitations of quality, acceptable cost and respect for ecosystem balance;
- regularisation of surface water resources so that consumption in general - and agricultural production in particular - are affected as little as possible by variation in flows;
- a strict policy of water saving (to contain abusive uses, losses and waste) and of combating all types of degradation (pollution, salinisation, eutrophication);
- the qualitative and quantitative sustainability of the resource so as not to compromise economic - and more particularly agricultural - development;
- development of the use of non-conventional water resources (recycled wastewater, brackish water, etc.) for economic purposes.

Moreover, Tunisia is developing major programmes against water pollution, so as to preserve water resources.

Mobilisation and utilisation of resources

Surface water

Tunisia's geographical situation, bordering the Mediterranean on the east and north and stretching to the Sahara in the south, gives it an arid, diversified climate.

- The humid and sub-humid bioclimatic zones in the Northwest, where rainfall is favourable (600 to 1200 mm/year) account for hardly 6.6 % of the territory.
- The semi-arid zone extends over the mountainous regions of Tell and the Dorsale and of the North East and has moderate rainfall (400 to 600 mm/yr) but occupies only 16.4 % of the country. These two rainy areas constitute the water reservoir of Tunisia for surface water.

- The rest of the country (77 %) comprises Central and Southern Tunisia, and is part of the arid or desert area where average rainfall varies from less than 100 mm/year to less than 400 mm/year. As these zones are sufficiently arid and generally have permeable soils and little topographic variation, surface rainwater available for use is virtually non-existent, and is stored below ground to form aquifers.

Inventory. Rainfall throughout the country is equivalent to an average of about 37 billion m³ per year, or an average of 230 mm. From this quantity, an average of only 2.7 billion m³ are annually mobilisable through a well developed hydrographic network, a topography favouring runoff and an impermeable geological stratum limiting infiltration; there are few aquifers in the North.

Water resources in Tunisia, disregarding salinity (million m ³ /year)				
Resources	Potential	Exploitable	In use	To be developed
Surface waters	2 700	2 700	1 400	770
Sub-surface waters				
– ground water	670	670	700	-30-
– deep water tables	1 188	1 188	930	258
Total	4 558	4 028	3 030	998

Source: Ministry of Agriculture (Direction Générale des Ressources en Eau - DGRE). Inventory, 1995

The mobilisable water is collected at 81 % in the northern basins, 13.7 % in the centre and only 5.2 % in the south.

The major basins in the North are the Medjerdah Basin, of the extreme North, and the Oued Miliane. Most dams are constructed on these oueds (16 units). In the centre, three dams have been built on the Zeroud, Merguellil and Nebhana Oueds. In the south and in the Sahel, no mobilisation of surface waters is possible.

The General Directorate for Water Resources (Direction Générale des Ressources en Eau - DGRE) carries out the inventory, the General Directorate for Studies and Hydraulic Works (Direction Générale des Etudes et Travaux Hydrauliques - DGTH) manages the resource, and works are the responsibility of the General Directorate for Dams (Direction Générale des Barrages). These three institutions are under the Ministry of Agriculture. Drinking water is managed by the National Company for Water Management and Distribution (Société Nationale de Distribution des Eaux - SONEDE) under the supervision of the Ministry of Agriculture.

Mobilisation and use. Surface water is considered of great interest for agricultural development since it irrigates nearly 131,500 hectares and during the floods it spreads over 170,000 hectares. This resource is now at risk because of the decline in dam storage capacity, which annually accumulates over 30 million m³/yr of silt. The implementation of the soil water conservation strategy has diminished this threat but contributed to reducing runoff water. If the multiplication of hillside lakes is on the one hand considered useful to creating water points, reducing floods and restraining flood surges, it might also limit the supply of water to dams, and critically compromise agricultural production in irrigated perimeters.

The large network of interconnected dams in the North improves the regularisation of surface water resources and minimises the dependence of the general consumption of agricultural production upon variations of inputs and/or on the reduction in storage capacity of certain dams. In a country as arid as Tunisia, the mobilisation of surface waters in dams is vital despite the loss of thousands of hectares of fertile land flooded by them, as well as a number of disruptions to ecosystems.

This operation is very costly; and the collected water must therefore be used to the maximum. The intensification of irrigated perimeters, with a view to raising the present rate of intensification from 90 % to 130 % contributes to amortising works and covers management costs.

The salinity problem which limits the use of water is less acute for surface water since 72% of this water has a saline content below 1.5 gr. and only 2 % has a salinity content above 3 gr.

Annual inputs fluctuate considerably, which inevitably has some effect on the production of irrigated perimeters since there are shortfalls reaching 50% compared to the average. Moreover, there is a natural imbalance between different regions, which is partially offset by the system of water transfers from the still surplus regions of the north-west and the centre-west towards deficit regions of the Eastern coast (N.E. and C.E.) - a very costly operation. It is used on a large scale for drinking water, which is transferred from the North region water complex as far as Sfax.

Underground Water

According to the 1995 inventory, the renewable potential of aquifers (depth of < 50 m) is estimated at 670 million m³ and that of deep reserves (depth > 50 m) at 1188 million m³. The management of aquifers and deep reserves is carried out within the limits of 700 million m³ and 930 million m³.

Underground water reserves are very important in the south, especially deep water tables that represent 44.7% of the underground water total. Potential fossil reserves represent 605 million m³, that is 33 %.

Aquifer salinity is fairly high. Only 8.4 % of aquifer water has a salinity below 1.5 gr/l while 60 % exceeds 3 gr/l. Deep water is less salty; 20 % has salinity of < 1.5 gr/l while 23 % has salinity over 3 gr/l. In general, salinity of underground water is greater than that of surface water (Ministry of Agriculture, DRES, *Annuaire de l'exploitation des nappes*, 1993).

Mobilisation and use. According to the development strategy for irrigated agriculture, 135,000 ha. are irrigated from surface wells, 67,000 ha from bore wells, giving a total of 202,000 ha. The potential of water with salinity below 1.5 gr/l represents 288.5 million m³ while water needs for 202,000 ha are estimated at least 1,010 million m³; thus more than 70 % of this land is irrigated with water with a +0.15g/l salinity content. This is at the origin of the problem of the soils' secondary salinisation.

Shallow water reserves are overexploited at the rate of 104 %. However, this average value hides some extreme overexploitation rates (120 to 130 %) in aquifers of the eastern coast of Cap Bon, and the Sahel of Sousse and of Sfax.

The example of the north-east, where irrigated agriculture is a well-established tradition, is significant. Existing aquifers have been exploited in the past in a harmonious fashion and only in recent decades - with the development of agriculture and the proliferation of wells equipped with motorised pumps - has the exhaustion of these aquifers become evident. The present situation in Cap Bon and in the Bizerta region is alarming. The degree of overexploitation of aquifers has reached such a stage that the sustainability of the resource is extremely threatened by the chemical degradation of water quality due to the intrusion of seawater.

Some irrigated perimeters have been totally abandoned. The measures taken by the administration to declare certain areas as safeguard zones did not have the success hoped for. On the other hand, present practice is promising, consisting in the artificial recharging of aquifers by flood surges, dam releases and from hill lakes.

Underground water is inventoried and managed by the DGRE, while the use of this water is controlled and supervised by the General Directorate for Hydraulics and Rural Equipment. This ensures its beneficial and efficient use.

Measures for water resource sustainability

Tunisia has a total estimated potential of 4.55 billion m³/y of which 3.9 billion m³ can be exploited, and has adopted a policy to ensure the use of all conventional resources which in quantitative terms can cover the country's water needs up to 2010. To reach this objective, 1,834.4 million TD have been allocated under the 9th Plan (1997-2001). Expenditures under the 8th Plan (1992-96) amounted to 1,087.5 million TD.

On the qualitative level, according to the study entitled "Economie, Eau 2000", (Economy, Water 2000) resort to non-conventional water resources is essential in order to improve the quality of water, in particular drinking water.

In order to limit resort to non-conventional water, efforts have focused on:

1. managing reservoir storage capacity by reducing silting-up through soil and water conservation activities;
2. increasing artificial recharge;
3. saving water by mastering water-efficient irrigation techniques and acting on losses especially of irrigation water. These losses are between 30 and 40 %. A simple saving of 10% covers the water needs of industry and tourism;
4. strengthening the price policy which final aim is to reach the real price of water. This special water tariff system promotes water saving by penalising major users and encouraging all those using techniques and materials which reduce water consumption;
5. intensification of the exploitation of water resources reserved to irrigated perimeters, by increasing the rate of intensification of cropping and making best use of available water resources;
6. preventive actions to avoid all types of degradation (pollution, salinisation).

The construction of purification stations upstream of dams helps to protect surface waters from all types of pollution. Also, legislative measures to safeguard water table resources from overexploitation and pollution have positive impacts.

Future strategy starting 2010 will be based on the exploitation of non-conventional water resources:

- desalination of brackish water from available aquifers and/or seawater while mastering both technology and per m³ production cost;
- increased research on purification technologies for waste water, the objective being to obtain better quality water for agriculture and to recharge overexploited and degraded aquifers. This becomes all the more important because the quantity of water needed increases with demographic growth.

VEGETATION RESOURCES

Demographic growth leads to human pressure on vegetation (forests, pasturelands, arable land) and causes serious ecological disruptions. This pressure is increased with the disorganisation of transhumance and sedentarisation, responsible for the extension of cultivated land at the expense of pastureland. The exploitation of vegetation for various purposes is the only source of income for people living in a forest sensitive to degradation and attached to reduced pasturelands, which no longer meets livestock forage needs. The two major consequences are: first the clearing of vegetation systems to convert them into arable land and second, the inevitable overgrazing, which impoverishes the pasturelands in annual and perennial species, thus contributing to the physical degradation of soils (erosion, desertification).

This phenomenon is reproduced on the marginal hillside lands and Jebels occupied by a dense population. Thus the reduction of vegetation cover after varied clearances or fires, the impoverishment of flora due to vegetation overexploitation and overgrazing, as well as the disruption of ecological balances that hinder species regeneration, all have a socio-economic origin. Severe climate incidents (droughts, torrential rains) only increase vulnerability to regression of vegetation cover.

The challenge is how to ensure cohabitation between the population and the least possible degraded vegetation cover, how to meet the needs of a population and improve its living conditions while conserving vegetation cover and without reducing its role in soil protection, air purification and biodiversity conservation.

Sylvo-pastoral potential, use and conservation

Tunisian flora has been definitely impoverished over time due to clearances, major fires and prolonged droughts followed by overgrazing. Its fragility is accentuated by that of soils and ecosystems in general; it is composed of 5,500 species and sub-species distributed between:

- forest resources (forests, maquis, garrigues derived from the latter due to degradation), mainly concentrated in the Tell and on the high formations of the Dorsale;
- steppe formations extending to all the Centre South of the country;
- Saharan pseudo-steppes and pseudo-sylvan areas;
- several specific formations of humid areas (grasslands, riparian formations, peat bogs..) and salty habitats (halophyte vegetation).

According to the pastoral forest inventory, vegetation cover is distributed as follows:

- 4 774 000 hectares of farmland
- 831 000 ha of wooded land (forest and maquis)
- 4 706 000 ha of pasturelands
- 393 000 ha wetlands and waterbodies
- 5 282 000 ha of desert lands and miscellaneous.

Pine trees are generally preponderant in forest areas (55% of the total forest area); followed by maquis and/or garrigues without trees (23.5 %), deciduous species only represent 21.5 %. The Aleppo pine predominates and represents 35.7% of pure stand forests. Reforestation has been carried out on 320,000 ha or 38.5 %.

Pasturelands differ between the centre and south in floristic composition and grazing value. The best pasturelands have developed in sandy steppes with deep soils. These are very sensitive to overgrazing and to cultivation, which accelerate wind erosion.

Natural forests have regressed markedly (at an estimated annual rate of 1 %) as shown by the relic formations observed in old unregenerate stands. The cork oak in the North is a typical example of a forest facing a regeneration problem.

Between 1971-1992, the annual reduction rate of pasturelands was estimated at 29,000 ha. As the area under annual crops is stationary, pasturelands have thus regressed in favour of tree crops (Central Tunisia, mainly the coastal plains of the Southeast). This is in line with the evolution of the forage balance, which shows a marked decline in the natural pasturelands. Tree cultivation in Central Tunisia - and more recently in the south-east - has increased rapidly, with planted areas rising by 703,000 ha in 21 years. (World Bank, Project TUN-5736).

Evolution in forage balance: 1964 - 1990 (FU millions)						
Year	Pastureland	Fallow	Cropped	Concentrate	Barley	Total
1964	1200 (63 %)	385 (20 %)	85 (4 %)	110 (6 %)	125 (7 %)	1905
1990	530 (20 %)	685 (26 %)	640 (25 %)	150 (6 %)	585 (23 %)	2590

Source: World Bank: Strategy for development of pastureland in arid and semi-arid zones, 1995.

Natural vegetation cover – forests and pasturelands - has undergone and continue to undergo qualitative and quantitative degradation. The first is due to the impoverishment of flora and the second to the reduction of areas and yields of wooded areas. The dynamics and the rhythm of evolution of vegetation stands are not well known, and deserve more detailed study.

Reduction mainly concerns natural stands. Reforestation carried out since independence (1956) has largely compensated the lack of vegetation cover but unfortunately does not replace degradation of biological diversity. Natural forests covered 3 million hectares at the beginning of the Christian era but dropped to 368,000 ha before independence (Development Plan for Forest and Pastureland Resources, DGF 1997).

At present, they cover about 837,000 ha. or 5.1 % of the total surface of the country, this forest cover ratio is considered insufficient. The General Directorate for Forests aims to improve it by programming the reforestation of 104,000 ha during the 9th Plan. The present rate of reforestation is about 15,000 ha/y.

In order to fulfil the forecasts of the 9th Plan, and taking into account the average degradation of 1%/y, vegetation, cover could reach 931,590 ha or a ratio of 5.7%. If one includes the forage bushes, vegetation cover will reach 10% at the end of the 9th Plan. Expenditures for reforestation and improved pasturelands during the 8th Plan (1992-1996) reached 195.3 million TD, a level considered insufficient. The 9th Plan (1997-2001) provides for 394.6 million TD that represents almost twice as much.

Changes in forest and pastureland resource production

The majority of Tunisian forests play an essential protective role and few are exclusively dedicated to the production of wood or cork. Most forests initially designated for protection have become productive.

The development of wood production has increased from an average of 85,000 m³ between 1960/70 to an average of 205,000 m³ between 1987/90 and to 232, 500 m³ in 1993.

Global distribution of harvested woods	
- Timber (sawmills)	5.2 %
- Building timber (poles, posts, mining timber)	28.9 %
- Industrial wood	5.2 %
- Firewood	50.7 %

Source: DGF, REF, 1997

The deficit in wood products especially concerns sawmill wood and industrial timber. This deficit is filled by imports:

Needs-Resources in wood products				
Type of Wood	Firewood	Timber	Industrial wood	Total
Needs	6 300 000	100 000	800 000	7 200 000
Forest production	376 000	188 000	376 000	940 000
Maquis and garrigues	3 924 000			3 924 000
Agricultural sector	2 000 000			2 000 000
Total resources	6 300 000	188 000	376 000	6 864 000
Rate of coverage	100 %	188 %	47 %	95 %

Source : DGF-REF, 1997

Cork production has decreased strongly from more than 14,000 tonnes in 1958 to around 8,000 tonnes at present. This decline is essentially due to degradation, and the ageing and state of health of the suberous trees.

Present and future measures

The sylvo-pastoral strategy (1990-2000) provides for the reforestation of 320,000 ha and the rehabilitation of 2,200,000 ha of pasturelands. In contrast to the ambitious goals of the strategy, actual results are modest. In order to improve these results and ensure the sustainability of reforestation and pastureland improvements, the administration is now in the process of modifying its approach so as to make users individually and collectively responsible by the implementation of the participatory approach and the progressive withdrawal of State intervention.

As regards forestry, future guidelines provide for:

- the encouragement of private initiative for the establishment of specialised afforestation enterprises;
- reconciliation of forest dwellers with the forest by generating income from forestry activities whilst ensuring sustainable management of forest resources;
- organisation of forest operators by the creation of service units, with the progressive disengagement of the state;
- pursuit of forest operations;
- pursuit of upgrading of national parks and natural reserves and rationalisation of their management.

Concerning pasturelands:

- pursuit of upgrading projects and development of pasturelands by intensifying awareness-raising activities for the population, emphasising their participation in the conception, implementation and on-going management;
- encouragement of development of pastureland resources on soils sensitive to desertification.

DESERTIFICATION

In accordance with the United Nations definition of desertification⁶, almost the entire country is threatened with desertification with the exception of the Northern Tell region, which is mainly comprised in the bioclimatic humid region.

Moreover, land degradation factors are of natural or anthropic origin. The fragility of Tunisia's ecosystems derives from:

- severity of the climate whose effects are accentuated by orographic and geo-pedological factors;
- demographic pressure, poor land use practices and inappropriate farming methods;
- livestock load and overgrazing.

These converging endogenous and exogenous factors have caused the present state of desertification, the ultimate stage of soil degradation, which results from the combined effects of water and wind erosion and salinisation.

In the absence of vegetation cover (destumping, ploughing, overgrazing), water and wind erosion act on the arable layer. The latter, rendered fragile by lack of vegetation, then disappears to leave only bare rock or calcareous crust.. The transport of sand and its accumulation elsewhere induce the formation of sand dunes (fields in the southern steppes of Jeffara).

State of desertification and threats

Evaluation of the extent of desertification is difficult, due to the lack of recent data on desertified land. The few data available comes from the 1/200,000 erosion map (1980) of the North and Centre and from the 1/1,000,000 desertification vulnerability map of 1976. Remaining data is derived from direct observations and/or surveys carried out within the framework of studies on agricultural forecasts.

On a territory covering 16.4 million ha, farmed areas cover 4,774,000 ha, of which 1,754,000 ha are marginal and barely fertile lands where desertification is most intense.

⁶ Desertification : "Land degradatoin in arid, semi-arid and sub-humid dry areas due to several factors, amongst which climatic variations and human activities" (Agenda 21).

Distribution of areas affected by erosion in the North and Centre of Tunisia							
Erosion areas	Total area	Spreading Zones	Zones affected by different types of erosion (%)				Global erosion
Regions	1000 ha	%	Very affected	Fairly affected	Wind Erosion	Total	1000 ha
Northeast	918.2	6.1	7.6	20.0	0.8	29	261.6
Northwest	1.153.9	0.3	10.0	18.0	0.7	60	336.3
Centre-East	1.630.9	12	1.0	10.0	3.0	38	226.7
Centre-West	1.828.6	2	6.5	24.0	0.4	54	570.9
Total	5.5316	5.5	5.9	18.0	28	47	1.385.5

Source : "Carte de l'érosion du nord et du centre de la Tunisie", 1980

The erosion map established in 1980 shows that out of 5.5 million ha mapped, 1.3 million ha are affected by erosion of which 740,000 ha are strongly or moderately affected. According to the national soil water conservation strategy, 3 million ha, that is one-fifth of the territory, suffers from water erosion, of which half is heavily under threat.

The study of Floret et al (1976), based on pedological and phyto-ecological studies of Southern Tunisia (area between the 100-200 mm isohyete) gives rather summary estimates about the state of desertification in southern Tunisia.

Desertification in Southern Tunisia		
- Areas little affected by desertification	18 200 km ²	17.2 %
- Moderately affected areas	42 200 km ²	39.7 %
- Highly affected areas	12 500 km ²	11.7 %
- Desert areas	33 300 km ²	31.4 %
Total	106 200 km ²	

Source: Floret *et al.*, 1976

Although not very recent, these evaluations give a basis for orienting future actions, in particular the installation of observatories to monitor the process.

In certain farmed perimeters desertification is so evident that it can be observed on satellite images as whitish rings indicating sand accumulation (Menzel El Habib, Daher de Degache, etc.)

The threat of desertification arises essentially from problems of natural resource use (water, soil, vegetation) leading to the reduction of land production. Natural environmental factors enhance this threat, especially the chronic and more or less persistent droughts which favour degradation.

Concerning the use of resources, the inadequate water management and the poor adaptation of farming methods to local environmental conditions (soil, vegetation, climate) are two problems far from being solved.

From a socio-economic stand point, human pressure induces the division and fragmentation of land holdings, and thus prevents the organisation of rational management. The overexploitation of underground water leads to the exhaustion of wells and water salinisation, whereas overgrazing and deforestation/clearance increase the fragility of soils.

On the social level, the poverty of the rural population, pushed by a survival strategy, does not allow for any medium or long-term action aimed at the conservation of natural resources. The dislocation of traditional community structures around activities linked to the use of resources has induced the loss of a sense of responsibility by rural populations.

Etat de dégradation des terres



Additional aggravating factors are: the sedentarisation policy with a property regime unsuited to sustainable development; the absence of a sustained land use planning policy; the unsuitability of administrative structures (centralisation, concentration, slowness); and the almost complete absence of studies and research/development.

In a recent study (Mhiri et al, 1998), the annual soil losses from various degradation processes were estimated at 37,000 ha of which 13,000 ha were irreversible.

The national action plan to combat desertification (PANLCD)

The achievements of natural resources conservation strategies are significant (water, soils vegetation) but the synergistic effect has not taken place because the promoted approaches are sectorial and uncoordinated. All actions are almost entirely undertaken by the administration and their adoption by the population constitutes the major problem of this interventionist approach. The assumption of responsibility and involvement of the population are absent from all soil and water conservation projects.

The **objective of** the PANLCD is to combat desertification and to reduce drought in arid, semi-arid and dry sub-humid areas. This should be done through resource protection and development measures based on improvement of both soil productivity and local inhabitants' living conditions. In accordance with the major principles of the Convention, this is an integrated and participatory approach, based on partnership and co-operation between public authorities at all levels, affected populations, farmers, professional organisations and NGOs. The approach also integrates the creation of a supportive environment (institutional, social, property regime) and the development of international co-operation at the sub-regional (AMU) and regional (Africa) level, as well as internationally.

Intervention zones. Since desertification affects almost the entire country and works in different forms and to different degrees depending on local conditions, the PANLCD provides for the sub-division of the country into major regions which are homogenous in physical and socio-agro-ecological terms.

They are essentially the socio-agro-ecological zones of Tell and Dorsale in the North, the Haute Steppe and the Basse Steppe in the centre, and Jeffara, the area of the Saharan Atlas mountain pasturelands, the area of the Chotts, Matmatas, Dahar and Erg in Southern Tunisia.

The procedure for establishing the PANLCD consisted in carrying out a broadly based consultation of affected populations and of technicians in charge of natural resources management, based on representative case studies of different regions, followed by a national consultation which enabled improvements to be made and adaptations of the programme to the political concerns of the country (fight against poverty, development of backward areas).

Components of the PANLCD. These were determined following an evaluation of the various sectorial strategies linked to combating desertification (national SWC strategy, measures against silting, sylvo-pastoral strategy), projects for development and management of natural resources. They concern:

- Consolidation of existing projects and actions to make them more consistent with the UN Convention to Combat Desertification and with sustainable development;
- Extension of land use and integrated rural development projects to all the governorates in the socio-agro-ecological zones, which will require formulation of regional guidance plans to combat desertification;
- identification of legislative and institutional accompanying and support measures.

The formulation of regional guidance plans will give central place to people's participation. Instead of creating new structures, the PANLCD is called upon to make best use of the civil society networks and existing professional organisations, local groupings, collective interest associations for water (Association d'intérêt collectif - AIC), sylvo-pastoral farming (AFIC) and for

soil and water conservation (ACES), Agricultural Services co-operatives (Coopératives de services agricoles - CSA) and NGOs.

On the legislative side, a management code for natural resources should be issued; on the social side, socio-professional organisations, the AICs and NGOs involved in combating desertification should be promoted, while integrating women at all levels.

The action plan covers a 20-year period aimed at attaining a level of protection that can reverse desertification. The total cost of the programme is estimated at 2,992 billion TD, to be financed by a National Fund to Combat Desertification (Law N° 97-88 of 29/12/97), fed by classical sources of financing reserved for natural resources management.

BIOLOGICAL DIVERSITY

Tunisia has a great variety of natural environments that have allowed for the development and the enrichment of biodiversity, as well as for the differentiation of continental and marine ecosystems.

The pressure exerted on the natural environment during the second half of the 20th century -- demographic growth and non-sustainable natural resource use-- has diminished biological diversity. This regression was provoked by habitat deterioration due, in turn, to the development of agriculture at the expense of natural vegetation (since the beginning of the century, farmed surfaces have more than quadrupled). Because of difficult abiotic conditions (harshness and aridity of climate, poverty and scarcity of soils), the disappearance and/or degradation of flora jeopardises the balance of the rather sensitive ecosystem.

This imbalance increases the degradation risks of physical components of the natural surroundings. This is especially true for soils, which ensure the reproduction of vegetable and animal resources. Moreover, the interdependence between the soil, water and vegetation systems means that the degradation of one resource leads to the dysfunction of the system. In turn, this indirectly leads to the impoverishment of biological diversity through the disappearance of certain vegetation species difficult to regenerate and of the fauna depending on them.

The increasing human use of land, marine, coastal and island environments can be considered as inevitable in Tunisia. Economic activities can however be conducted so as to conserve biological diversity as shown by the national strategy and action plan for conservation.

Existing potential

Inventory and identification efforts have shown that the vascular terrestrial flora comprises 2,163 species to which should be added all exotic species that have been introduced.

Amongst this flora are found endemic Tunisian species, Tuniso-Algerian, Tuniso-Libyan and Saharan species. There are 20 Tunisian species, 13 sub-species and 9 varieties, 72 Tuniso-Algerian species, 8 sub-species and 3 varieties, 6 Tuniso-Libyan species and 3 varieties.

Concerning fauna, invertebrates are not well known. Only 27 species of gastropods and 10 species of scorpionides are the most studied. Several hundred insects are known following detailed studies relating to their impacts on agricultural production (110 nematodes identified). In the case of vertebrates, 63 species of reptiles and 362 species of birds are important players in biological diversity. Wild mammals are characterised by an original biogeography and a specific diversity (78 species).

Marine ecosystems are characterised by a fairly rich flora, which has been little studied. About 164 species of microphytes and 400 species of benthic macrophytes are known. Species are much less threatened than population groups like *Posidonia* grass and *cytoseira*.

The marine fauna is also little known, especially zooplankton and invertebrate populations (sponges, molluscs, crustaceans, echinoderms, etc.). The population of vertebrates is composed of

marine mammals such as monk seals --which seem to have totally disappeared--, quite numerous marine birds especially in the Gulf of Gabes, sea tortoises which are protected, cartilaginous fish (59 species), bony fish (227 species in Tunisia out of a total of 532 in the Mediterranean).

The panorama of Tunisian biodiversity contains great richness despite lacunae and needs for more complete inventories. It also reveals the great fragility of ecosystems and the degree of anthropic degradation. The situation of marine biodiversity is definitely better, reason for which it must be better preserved.

Problems of biodiversity conservation and management

The assessment drawn up for the strategy and the action plan highlight the insufficient national capacity for biodiversity management, with the following main characteristics:

- A regressive evolutionary trend and loss of biological resources, degradation of ecosystems and their habitats (soils, water and vegetation). This is also true for forest ecosystems (difficulties in regenerating cork oaks) as well as steppes (esparto) and marine (Posidonia) ecosystems;
- Insufficient protection of natural habitat from many anthropic intrusions (clearance, overgrazing, chemical pollution);
- An impoverishment of agro-biodiversity and the alteration of local genetic resources;
- Insufficient *in situ* (parks, protected areas, natural reserves) and *ex situ* (gene bank) conservation;
- lack of mechanisms for control, monitoring and evaluation;
- a patent trend of various terrestrial and marine habitat towards desertification.

Users of biodiversity (shepherds, foresters, farmers) are not aware of the economic and social importance of biological diversity and of the role it can play in the harmonious development of society in accordance with the preservation of its natural environment.

Conservation and management of biodiversity are the competence and responsibility of the State whilst the use of this resource is largely the right of individuals and local communities. This poses the problem of making users aware of their responsibility.

Biodiversity degradation factors

All studies point to the increased demand for natural agricultural and fishery products (wood, pasturelands, etc.) as the primary cause of degradation linked to demographic growth.

The second cause resides in the poverty of rural populations and the scarcity of non-agricultural resources, which impels these people to run down natural resources capital to ensure their survival (excessive withdrawals, overexploitation, overgrazing).

The exhaustion of agro-biodiversity variety results from the development of intensive commercial agriculture, the simplification of farming systems and the unreasonable use of biocides. The adoption of new and more productive varieties and strains has marginalised the use and conservation of local race varieties and culminated in the disappearance of a number of them (cereals, melons, canteloupes, peppers...).

Sectorial strategies often do not integrate biodiversity; in several cases objectives turn out to be contradictory. For example, the cereals strategy aimed at self-sufficiency does not take into account the impact of the extension of cultures to the detriment of biodiversity in marginal areas (pasturelands, degraded forests).

Past and present achievements

Past efforts for natural resources protection had indirect positive impacts on biological diversity. From the first development plans, the State had put in place sectorial activities for restoration of lands suffering from water erosion, reforestation programmes and protection of pasturelands to

ensure their regeneration. Despite these efforts however, the results of nature conservation efforts have not been convincing.

In the light of this outcome and the importance of its biological heritage, Tunisia has over the last decade worked to develop knowledge of a large number of biotopes and land-based and marine biological compartments and has introduced strategies for prevention, restoration and rehabilitation (MEAT). *In situ* conservation has been developed by building up existing parks, creating new ones (more than doubling the total) and multiplying natural reserves (DGF, Ministry of Agriculture and Ministry of the Environment), which has permitted the safeguarding of flora and fauna on the way to extinction.

Ex-situ and *in-situ* conservation should work in parallel. The few laboratories, such as those of the Institute for Arid Regions at Medenine, the National Research Institute for Rural Engineering, Water and Forests (INRGREF) and of the National Institute for Scientific and Technical Research (INRST) should develop their gene data banks in particular in the field of agro-biodiversity.

Action plan for biodiversity conservation. On the basis of the general observation of the regressive evolution of biodiversity and the threats to its sustainability, a determined environmental policy was drawn up over some ten years, and the UN Convention on Biological Diversity was ratified in 1992, committing Tunisia to establish a national strategy and conservation action plan.

This action plan is based on the national strategy and involves a global integrated approach, articulated around four principal axes: a better knowledge of biological diversity at species, ecosystems and genetic resources level; the establishment of favourable conditions for planning the sustainable management of biodiversity in general and of ecosystems in particular; improved awareness-raising, education and information on issues relating to biodiversity; the establishment and application of intervention programmes in priority areas.

Programmes have been drawn up in reaction to various observed shortcomings. Eighteen priority projects have been defined, requiring a budget of 17,440,000 TD. They cover six priority areas:

- combating genetic erosion
- protection of ecosystems
- adequate management of ecosystems
- integration of biological diversity within sectorial strategic options
- establishment of an appropriate institutional regulatory framework
- training, information, development of knowledge of biodiversity.

ECOSYSTEMS AND SENSITIVE AREAS

As a result of its geographical location bordering both the Mediterranean Sea and the Sahara, Tunisia has a diversified Mediterranean climate marked by its harshness and above all its aridity. All the Mediterranean bioclimatic zones from humid to desert are represented, but the arid and desert zones dominate (77 %). To this climatic aridity, characterised by the scarce and irregular rainfall and violent wind, is added an unsuitable farming system favouring soil degradation. There are only few areas, which have not been disturbed by human activity. These abiotic and anthropic conditions have seriously affected flora and fauna and the ecosystems within which they evolve.

Natural zones in perfect ecological balance are rather rare. However, relic spaces, with biotic and abiotic elements that have resisted degradation, reveal the past history of a disturbed habitat.

Taking the fairly broad definition of natural area⁷ adopted by the study of sensitive areas carried out by the MEAT⁸, almost the entire country - with the exception of urban areas - is covered by natural zones. Within these major zones, relics of natural ecosystems survive under more or less major threats, which determine their level of sensitivity. The question is then to determine how to reduce sensitivity of or even to attain certain stability in these zones.

Major natural areas and priority sensitive areas

Mogods-Kroumerie. This is a sylvo-pastoral sub-region, with the highest rainfall in the country (600 mm/y), characterised by chains of hills with steep slopes on which more or less humus bearing acid soils have developed and have been colonised by a vegetation based on cork and Zeen oaks in non-degraded zones. Strong rainfall, together with accentuated topography, implies a certain vulnerability to erosion. It is a highly populated region whose economy is based on the combined use of the forest, clearings and small plains to develop extensive livestock raising comprising bovine cattle and goats. Human pressure is reflected by the heavy livestock load, which is at the origin of the degradation of the scrubland.

The valley of the Atatfas, a natural area with a cork oak maquis, constitutes a priority area where erosion and vegetation degradation is at a fairly advanced stage. Strong anthropic pressure reduces vegetation to a maquis with low economic value and strongly diminished biological diversity. It is an ecosystem whose state of degradation is fairly advanced but with a possibility of rehabilitation, despite the difficulties of regenerating cork oaks in situ.

The Cap Bon peninsula. This region is part of the higher semi-arid area and sub-humid area, with fairly abundant rainfall. It is characterised by fairly fertile coastal plains that contrast with the hilly hinterland (Jebel Abderrahmane). The plains are highly populated and intensively farmed, which is one of the causes of the aquifers' salinisation. The interior of Cap Bon is under dryland farming but conserves typical and valuable natural spaces.

Jebel Abderrahmane consists of a set of agro-sylvo-pastoral ecosystems. The farmed fields on the foothills are succeeded by a maquis populated by Kermes oaks with two facies (Corido Thymus Capitatus and Coris monspelliensis, and Lavandula Stochas and Rosmarinus officinalis facies). The scrubland with Quercus coccifera and Erica Arborea starts at an altitude of 300 m.

The salty coastal marshes are fragile and complex where numerous sub-systems interfere: continental water, marine water, halophyte and coastal vegetation, microfauna, meso fauna, shellfish, fish, crustaceans (in certain places), etc. This complex system is very sensitive to any disruption, essentially pollution.

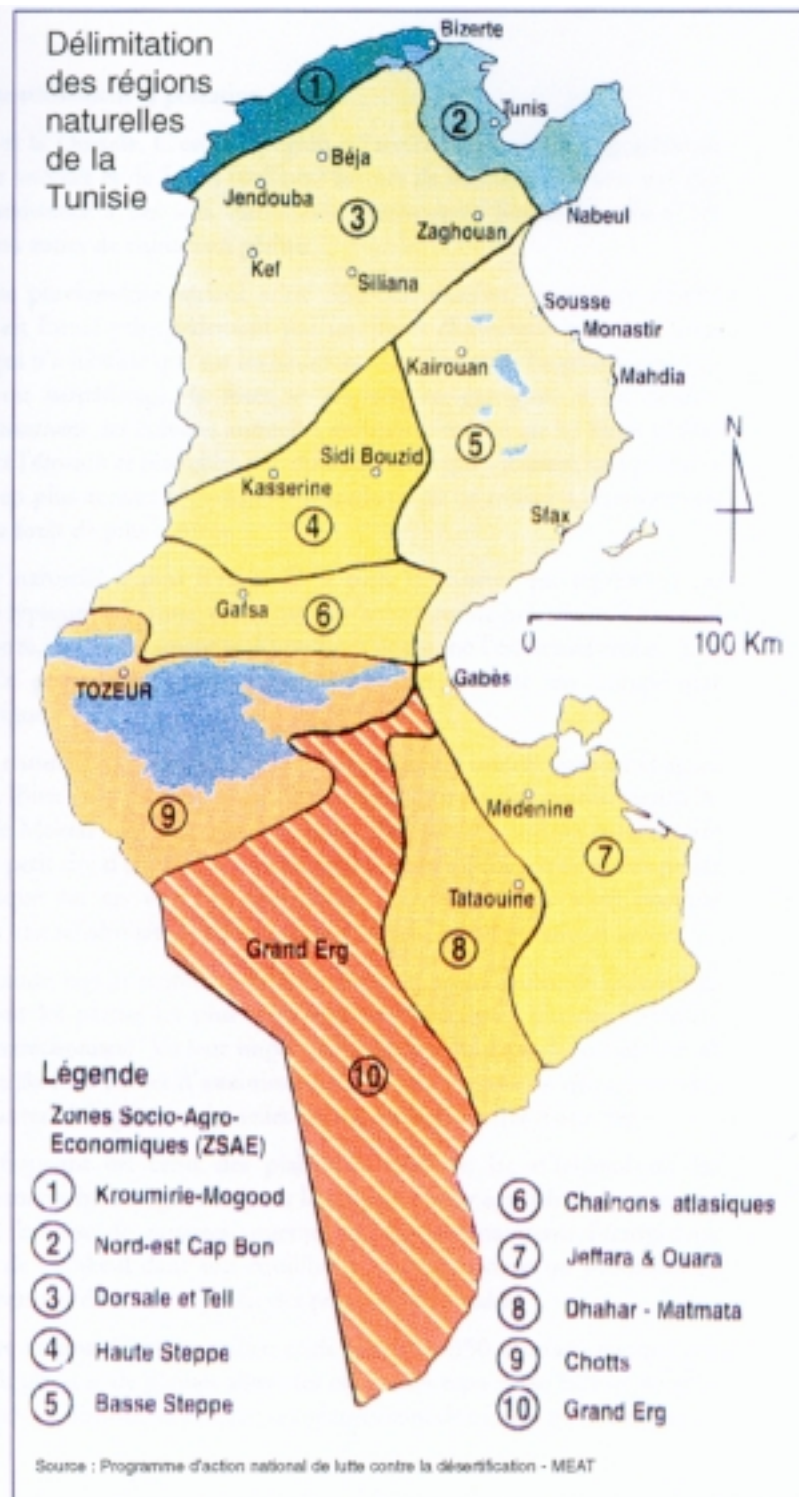
Tell and Dorsale. This region is characterised by a topography of rolling plains and Jebels (hills), formed by calcareous substrata that gave birth to carbonated soils. The latter are fairly fertile and offer the best farming plains.

With rainfall varying between 350-600 mm/yr, the natural vegetation cover is formed mainly by a climatic forest based on Aleppo pine having only survived on the crests. Under the effect of excessive farming and overgrazing, the forest has degraded into garrigues and moors. The invasions of annual wheat crops even on the steep slopes has accelerated erosion and shrunk the forest pasturelands, which are under ever increasing pressure. The degradation of this area has seriously affected the Aleppo pine forest.

The natural area under Aleppo pine of the Kesra forest, a typical example of this zone, is a priority sensitive area. The site of Jebel Louza, once a dense forest, only has 8% forest now. Sparse tree growth covers 55% and the rest consists of garrigue.

⁷ Any extension of land or freshwater/brackish water, covered by natural vegetation formations, disturbed or not by human activities and/or containing wild fauna, geographically well defined and distinguished by its biotic and abiotic special characteristics.

⁸ By the Directorate for the conservation of nature and the rural environment.



The natural area of Maktar is populated by cypress trees, a species of great interest both in forestry and in agro-forestry. Because of reforestation measures the Maktar cypress no longer exists in Tunisia in its natural ecosystem, and only subsists in a small 4-hectare site near Bouabdella. This small relic forest is on its way to extinction. Its regeneration is only possible once its surrounding environment has been rehabilitated from the effects of severe erosion.

This large region includes plains whose lowest parts are occupied by "Merjâa" (marshy zones). They are the main agricultural areas of the country, and because of their agricultural importance, they are being drained. This induces the disappearance of the original biological components of these natural wetlands.

The plains bordering Lake Ichkeul are a striking case: hydro-agricultural works for cultivation of the area have required urgent measures to maintain the Ichkeul humid ecosystem in equilibrium and to integrate it into a sustainable development process to the benefit of the local population.

The High Steppe. This arid area (rainfall 250-350 mm/y) is marked by large glacia and alluvial plains that offer the most developed farming areas in central Tunisia; the plains are dominated by imposing mountain ranges. The areas below these mountains are occupied by agriculture based on extensive livestock farming, tree growing, annual crops and diversified irrigated crops. The glacia and the plains --which used to be rich steppe pasturelands-- are now being degraded by erosion and overgrazing. Amongst the sensitive natural habitats, the esparto steppes covering the glacia and the low foothills, disturbed by ploughing and overexploitation, are undergoing severe degradation.

At high altitude (1000 m) the mountains conserve with difficulty a typical natural forest vegetation, "l'iliçaiè" based on holm oaks. This vegetation is rather sensitive and threatened by coal mining and overgrazing. The Châambi National Park has been set up to protect this vegetation.

The natural zone under *Acacia raddiana* in the Bou Hedma region presents a unique agro-forestry area in pre-Saharan Tunisia. Despite the existence of the Bou Hedma National Park, it continues to be a high priority sensitive area. The very severe abiotic conditions enhanced by human activities render the development of this relic vegetation very vulnerable.

The Chotts and the southern plains. The low Southern steppe characterised by high aridity (rainfall <150mm) is under dry farming, mainly in pasturelands developed on skeletal soils undergoing degradation due to the effect of water and wind erosion. Further to the south, the Chotts area consists of vast salty and desert depressions, whose surroundings include very unstable wind-sensitive excrescence and veil. The latter are irrigated where natural water points occur (oasis). All these territories are very sensitive to degradation and much more so the sandy steppe situated between the 'chotts' and the 'erg' colonised by a well-developed natural xerophyte vegetation.

This area is highly sensitive to wind erosion. The case of Regim Maatoug is striking for more than one reason. The development of new oases followed by the sedentarisation of a nomad population has given rise to huge desertified rings (invaded by sand) due to overgrazing and eradication of wooded species. However, the settlement of populations around new oases would, in the long run, contribute to better management of space and would anchor development centres in this Saharan area.

The Matmata/Dahar complex. This is a hilly area characteristic of the south of the country. It bases its economy on semi-intensive runoff agriculture in the talwegs (fruit tree growing) and extensive agriculture based on livestock using the slopes of the hills and the Dahar - the very large Western slope of the Matmatas chain.

The cultivated talwegs have created very sensitive ecosystems that need continuous maintenance of dams, which trap runoff water that conditions their survival. The Dahar has very vulnerable soils, which are rapidly desertified by ploughing.

The Beni Khédèche Dahar is to be classified in a very sensitive area since repeated ploughing for cereals - that grow during rainy years - has considerably affected the landscape (deflation, silting-up, scarcity of woody plants and annuals).

The natural area of Eastern Erg - Jbil National Park. This zone is the best protected against degradation because of its greater inaccessibility to people. Despite sparse vegetation cover, it is the last refuge of the most sought after animal species (the dune gazelle, the oubara bustard). It is well protected but highly sensitive. The deterioration of vegetation around the oilfields of El Borma has favoured the development of shifting sand dunes. Their effects have been reduced by hydro-agricultural works carried out in the surroundings of the oil operations.

Sensitive natural coastal areas

Abiotic factors (swells, storms, harshness of seawater...) and human pressure are the main factors causing the degradation of coastal areas.

Marine habitat. The gulf of Gabes has been classified as a very sensitive area due to three main factors: the shallow depth of the sea, the slight slope of the continental shelf and the increasingly scarce population of certain species of flora and fauna resulting from ecosystem changes, amplified by land-based pollution and the retreat of carpets of marine phanerogam.

The gulf of Tunis and the Gulf of Hammamet are both classified as sensitive areas. They are, in fact, highly populated and urbanised areas, favourable to human activity and subject to strong exploitation and pollution pressures.

Despite the fact that the North coast is not submitted to important human pressures --apart from coral overexploitation-- because of the harshness of its climate and the depth of the sea, it still constitutes a sensitive area.

The coastal land habitat. Dunes and coastal fringes are classified as sensitive ecosystems because of the retreat of the protective vegetation cover which enhances wind and wave erosion, and, most important, because of strong human pressures (buildings and hotel complexes).

The sand dune fields (Zouara, Rimel, Ras Jebel, Raf Raf, Gammarth, Dar Chichou, Ghedhabna) are also classified as very sensitive areas. They constitute the continental prolongation of the coastal dunes and are sought after for grazing, farming, and for urban tourist and infrastructure development.

Marine and soil erosion on cliffs of soft rocks threaten agriculture (N.E Ras Jebel, Ghar El Melh, Gammarth, Sidi Bou Said), urbanisation (Gulf of Tunis as well as the historic sites of Cap Bon, Hergla and the Kneiss islands, and prehistoric sites in the grottoes Hergla and Monastir), and tourism (Skhira, Jorf, Jerba). These cliffs are classified as very sensitive areas.

The boggy areas are classified as very sensitive: they are very sensitive to pollution and marine erosion as well as to overexploitation of their animal resources (shellfish) and to the disturbance of bird fauna of international interest.

The islands of Kerkennah and Djerba - that include elements of sensitive areas described above - are very sensitive island spaces.

All the very sensitive coastal areas are of economic (fisheries resources in the Gulf of Gabes, wood production from the best dune forests), tourist (dunes and coastal fringes), ecological - for migrant game boggy areas, and environmental interest (quality of life, biodiversity, ecotourism). Furthermore, the very sensitive areas also contain economic, urban and tourism infrastructures.

Beaches being subject to erosion, pollution (hydrocarbons, waste, non-biodegradable plastic waste) and mining (sand), are classified as sensitive.

3. ...and major development/environment issues

URBANISATION AND "COASTALISATION"

The Tunisian coastline extends for 1300 km and is characterised by the richness of its natural habitat and the diversity of its landscapes. The well-watered northern coasts harbour natural vegetation colonising an uneven relief and creating picturesque landscapes. Those of the eastern coast offer important natural resources. The coastal plains of Cap Bon, the Sahel from Sousse and Sfax to the Gulf of Gabes have fertile soils and contain major aquifers.

Apart from these resources, Tunisian coasts are easily accessible both by land and sea. This has given rise to flourishing trade and has favoured human settlements. Tunisian coasts, are now home to 70% of the population and 73% of dwellings. This area contains the bulk of economic activities (93 % of tourism activities, 88 % of jobs in the industrial sector). If this concentration has taken place to the detriment of agricultural land, the coastal agricultural sector however conserves its productive potential despite some overexploitation of natural resources.

A very ancient coastal urbanisation

The Tunisian coastal area, especially the eastern coast, because of the beauty of its landscapes and the richness of its natural resources --both land and marine-- has always attracted civilisations which have succeeded one another. Settled by Man since earliest times, there are more than 200 ancient sites along the seashore. Carthage, a historic city of world reputation, symbolises the attraction of the coast and its subsequent urbanisation.

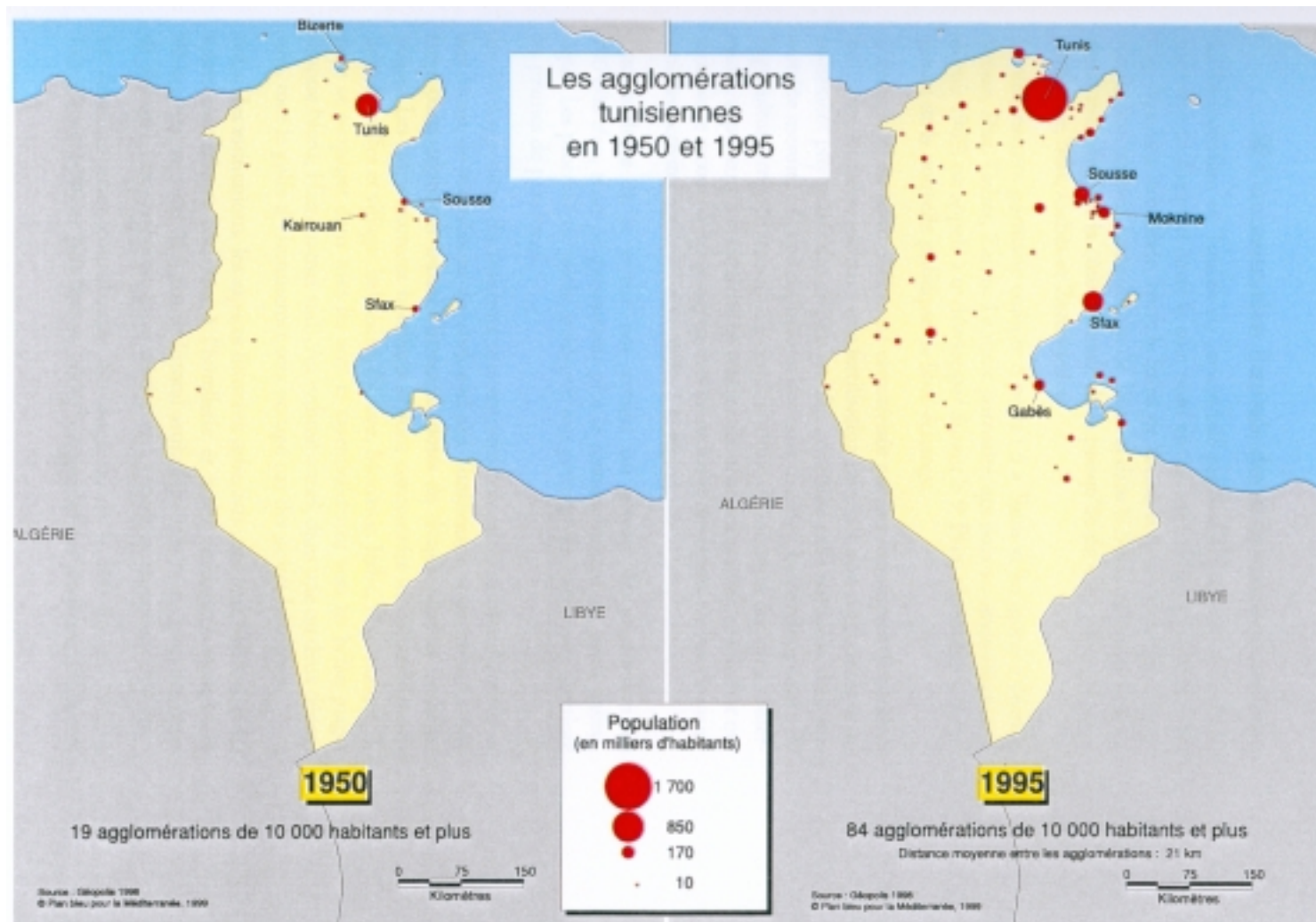
The most important attraction factors towards the coast have essentially been natural resources, easy access and later urbanisation and economic poles development.

First of all, the exploitation of fishery resources has involved the settlement of fishermen. They were at the origin of a great number of human settlements. In Tunisia these resources are only available in the sea; there are no fish-bearing rivers or lakes inland.

The coastal resources in water and soil were determining for human settlements. The coast is constituted by fertile plains of soils well adapted to the intensification of agriculture. This could be either dry farming with tree crops (olive trees) or irrigated farming owing to the presence of aquifers. When comparing the two stretches of coast between Hammamet-Korba and Bou Ficha-Hergla, the first has fertile soils and freshwater aquifers while the second has salty rather infertile soils and no underground water resources. The resources of the first were at the origin of the coastal towns of Hammamet, Nabeul, Beni Khair, Korba, and it is the absence of resources of the second which explains the present lack of urbanisation.

With tourism development and the emergence of beaches as a new natural resource, it is very likely that such areas become populated as it is happening at present in South Hammamet, area that did not have large water and soil resources.

At present, urbanisation and coastal development have combined to attract more people who find employment more easily in the major economic poles (Tunis, Sousse-Monastir, Nabeul-Hammamet, Sfax, Jerba-Zarzis...). The question is then how to safeguard the coastal area.



Coastal towns

The urban population has developed rapidly since independence, from 38 % in 1956 to 49 % in 1975 and 61 % in 1994. It will reach 75 % in 2010. 76% of this urban population is in the coastal area.

All major towns of over 100,000 inhabitants are situated on the coast, except for Kairouan. Tunis has 1.6 million inhabitants or 31 % of the total. It is far bigger than Sfax and Sousse. Most of these large coastal urban centres are situated on the most fertile coastal plains.

The rapid growth of towns induced the proliferation of unregulated dwellings, which transformed coastal towns and seaside resorts. On the physical and ecological level, the components of ecosystem balance were radically changed; buildings on coastal sand dunes and in flood-prone areas created erosion problems and beach shrinkage as well as the proliferation of mosquitoes in stagnant water.

Uncontrolled urbanisation also affects agricultural potential by consuming agricultural land. The peri-urban agricultural perimeters soon lose their vocation and become the prey to a process of urbanisation avid of space. Solid and liquid wastes from uncontrolled urbanisation also affect the marine habitat.

Coastal concentration of economic activities

The coastal development of Tunisia is characterised by its spatial discontinuity. The contrast is striking between the North coast, which is still fairly unspoilt, and the Cap Bon east coast, well urbanised between the Sahel of Sousse and that of Sfax. Coastal development is marked around Tunis and in the Sousse Sahel, and to a lesser extent on the eastern coast of the Cap Bon peninsula, and around Bizerte, Sfax, Gabès and Zarzis-Jerba.

There are 8 harbours: 3 in Tunis, and the rest in Bizerta, Sousse, Sfax, Gabès, Zarzis. Harbour traffic, virtually stagnant from 1989, should develop during the 9th Plan in response to the new free trade policy.

Coastal agriculture is characterised by fairly advanced technologies, including considerable use of inorganic fertilisers and increasingly generalised phytosanitary treatment. To a certain extent this contributes to the pollution of seawater. The development of intensive irrigated agriculture has led to the overexploitation of ground water; the response has been to design recharge programmes in order to maintain the agricultural activities necessary to the region.

Aquaculture and fishing have reached a production level of 100,000 t/y, but no longer permit the renewal of the fish stocks. Unsuitable fishing practices have disturbed habitats and degraded Posidonia prairies.

The development of international seaside tourism, as well as the aspirations of Tunisians for holidays and weekend leisure pastimes, has contributed to the important occupation of flat shorelines and beautiful beaches. Hotel infrastructure at first concentrated near seaside towns and villages (Sousse, Monastir, Jerba, Hammamet...) but then proliferated in every direction, mainly towards the beautiful beaches (North Sousse, South Hammamet). At the present speed, in one or two decades, hotel complexes will occupy the entire Gulf of Hammamet.

According to estimates, the urbanised coastal areas cover 140 km and tourist areas occupied by hotels and second homes cover 80 km. This sums up to a total of 220 km of artificial coastline (18 % of the total Tunisian coastline). Projects underway or under study would occupy 230 km.

The marked development of tourism, from 4,000 beds in 1962 to 142,500 in 1995 and 200,000 in 2000, has given rise to different pressures --on the coastline, on arable land, on ecosystems equilibrium, on water. With the ongoing projects, about 150 km of the shoreline will be occupied by tourist activities (hotels, leisure installations, and holiday villas...). Moreover, the installation

of tourist infrastructures too close to the shore and especially on the shore dunes, accelerates the process of beach erosion observed in recent years.

About 10,000 ha of coastal arable land are converted (4000 ha in 1993). However, a major part of tourism developments has been and will be carried out on the non-agricultural salty "sebkhas" soils and on consolidated dunes with barely fertile soil. The conversion of land is therefore not catastrophic; however, the abandonment of peri-urban agriculture in favour of tourist activities is significant, which gives rise to real estate speculation around tourist areas.

Pressure on water supplies is not alarming since tourists' water consumption only amounts to 6 % of national consumption. Simple measures to conserve water in agriculture would easily cover this consumption. But the biggest threat for the coastal area is the fate of wastewater. A major effort has already been made in relation to sanitation in tourist areas; however, to prevent beach pollution it is essential that hotels contribute more significantly by recycling their wastewater and pre-treating it before it goes to the treatment station.

The bulk of industrial activities are concentrated on the coast. With a strong concentration of population and performing infrastructure (roads, harbours, airports, communication links) the major coastal industrial poles (Tunis, Bizerta, Sousse-Monastir, Sfax, Gabès) concentrate over 80 % of industrial activities. There are 1,257 ha. of industrial zones either completed or under construction along the coast out of a total of 1,410 ha. for the whole country.

Industrial statistics from 1972 to 1995 show that the traditional difference between the coast and inland has been maintained; the industrial capacities have been redistributed along the coastal strip to the benefit of the Sahel of Sousse and Sfax, whereas, despite the creation by the public sector of major capacities for processing cork, sugar, building materials and paper, the inland regions stay weak.

At present, the Northern coast is far less threatened than the eastern coast, with the exception of the dumping of industrial waste into the Bizerta Lake. The Gulf of Tunis is losing its beaches to marine erosion, while the southern lake is being polluted by numerous discharges from the country's largest industrial zone. On the other hand, the northern lake has been saved following the disappearance of the strong stench and the increased transparency of its waters. On the eastern coast, close to Hammamet, Sousse, Monastir, beaches are shrinking and cliffs are retreating (Monastir); in the Sfax area, *Posidonia* grasses are being polluted and degraded, and beaches at Kerkennah are being degraded.

Despite efforts made to construct treatment plants in seaside resort areas, a number of shortcomings persist, especially concerning the pre-treatment of industrial discharges and the non-conformity of discharges with prevailing standards, in particular in the North of Tunis, Sfax and Sousse.

On the southern coast, main damages to the environment are discharges of phosphogypsum into the sea (12,800 t/y in the Gulf of Gabes), modification of beach morphology due to harbour developments and the decline of coastal agriculture and fisheries.

Djerba Island used to have a balanced island ecosystem; its beaches are now being eroded and are in retreat because of the concentration of tourism activities; its orchards are being degraded in favour of anarchic building. Only the Bibane lagoon, because of low demographic pressure and controlled exploitation, maintains a certain stability and fishery resources.

Planning and management of the coastal area

Except for the Northern coast, between Tabarka and Bizerte, and the Western coast of the Cap Bon peninsula, the rest of Tunisia's coast is threatened with massive exploitation which reaches its zenith around major urban centres (Tunis, Sfax, Sousse-Monastir, Bizerte, Gabès).

The concentration of various economic activities on the coast gives rise to problems linked to the fragility of coastal ecosystems, to the overexploitation of resources and above all to the often inappropriate use of space. Moreover, the coastal area is not only sensitive to uses of its space; in

the hinterland, hydraulic works (construction of dams, hill lakes, units for spreading flood surge waters,) have markedly reduced marine sedimentation, the principal source of sand for beaches. To this is added the extraction of sand from beaches and beds of oueds that aggravate the sedimentation shortfall.

Based on these general observations, the MEAT - through the Agency for Coastal Protection and Planning (APAL) - drew up an action plan with a set of directives and proposals in compliance with the national policy to safeguard the environment, and more especially to preserve the coast.

**The missions of the *Agence de Protection et d'Aménagement du Littoral* - APAL
(Agency for Coastal Protection and Planning)**

- co-ordination of programmes launched and applied to the coast;
- auditing occupation contrary to the law in the public maritime domain;
- monitoring and control of the domain with enforcement power;
- control of the real estate situation in sensitive coastal areas requiring protection;
- co-ordination between organisations involved in the use, protection, conservation and upgrading of the coastal area;
- monitoring of the coastal environment by installing an observatory;
- studies and research on the protection of the coastal area, impact studies, establishment of management plans for sensitive zones, development of eco-tourism;
- dissemination of information to interested parties.

The **first five-year action plan (1997-2001)** emphasises the preventive approach rather than reaction to problems, as well as participation of local decision-making level in the environmental management of the coastal area. The actions have five major components.

- Management of the Public Maritime Domain, which has been the object of appropriations and anarchic uses that have affected ecological equilibrium and the rights of Tunisians. To remedy this, several actions are foreseen: to regularise and audit the real estate situation on the coast, to carry out land use actions within the limits of the Domain, to adequately manage temporary occupation and uses, to normalise modalities relating to concessions, and to solve present cases of encroachment.
- Coastal Observatory (Observatoire du Littoral). The management of the coast requires enlightened decision-making based on pertinent and reliable information. Put into place within APAL in 1997, the observatory will monitor the development of coastal area to assist decisions, develop a system of data acquisition and treatment, and disseminate data to all interested parties. The observatory will collaborate with the Sea Observatory (Observatoire de la Mer -ISTM) as well as with the Tunisian Observatory for the Environment and Sustainable Development (Observatoire Tunisien de l'Environnement et du Développement Durable - OTEDD).
- Management of sensitive areas. Human pressure on the coastal area involves the risk of seriously degrading nature sites, affecting ecosystems equilibrium, threatening the biological diversity and compromising the special characteristics of the Tunisian coastal landscape. The areas containing habitats of endangered species, the remarkable natural landscapes and elements of the historical national heritage are the main sensitive areas to be protected. The establishment of a conservation programme to preserve the Tunisian heritage and actions to rehabilitate degraded sensitive areas and the protection of endangered species, are part of these actions.
- Integrated management and intervention. The large number and variety of economic activities within the coastal areas require the establishment of guidelines for natural resource occupation, use and exploitation, the rationalisation of legislation and existing regulations, and a better co-ordination between government organisations. Interventions and works for the upgrading and protection of the shoreline are also foreseen.

- Environmental assessments. This classic activity carried out by the MEAT will be better focused on the coastal area. It mainly aims at checking the conformity and harmonious integration of land uses and interventions with coast protection and development policies. The main action consists in the establishment of a programme allowing co-ordination with other concerned parties and training of APAL personnel in order for them to proceed to evaluating projects.

URBAN DEVELOPMENT

Urban population has increased from 2.7 million in 1975 to 5.4 million in 1994, thus doubling within 20 years.

The rate of urbanisation has gone from 49 % (1975) to 61 % (1994) while the annual rate of urban growth, well above that of population, rose from 3.4 % in 1975 to 3.8 % in 1994. This evolution was fairly moderate for the big cities (2.9 %) in comparison with other urban centres.

In future, the rate of urbanisation could exceed 75 % in 2010; and another 3.2 million town dwellers will be added to those already living in the big cities.

Economic potential will be localised in the major cities and more especially in the metropolis-conurbation of the Tunis District, the regional metropolis of Sfax and the conurbation around Sousse-Monastir. These urban centres, where the bulk of economic potential and road, harbour and airport infrastructure are concentrated, are destined to be the backbone of economic integration and the development engine for the whole country.

Within the present context of economy globalisation and the country's opening to international competition, town development requires communications and accessibility, low-cost production factors, fiscal incentives and good quality services. The growth of urban population in turn requires building sites, housing, infrastructure and equipment. The additional 3.2 million town dwellers could involve using up to 30,000 ha of land and building 460,000 housing units.

Impacts of urban growth

The rapid growth of towns has induced a proliferation of spontaneous dwellings. The inadequacy of the classical housing supply (state, private) in relation to explosive demand has led to the development of an informal real estate market which has absorbed 40 % of the demand for building sites and 25 % of the additional housing stock. Anarchic housing covers 32 % of urbanised surfaces in Tunis and 36 % in Sfax.

In the anarchic quarters, the quality of life has deteriorated due to the difficult access to municipal services, insufficient water supplies and sanitation. The spontaneous housing is at the origin of the major pollution issue of non-treated domestic wastewater and domestic waste.

The production of domestic waste collected by the municipalities is estimated at 1,200,000 tonnes/y for the whole urban population. A large additional non-estimated amount of waste pollutes the countryside and is often carried out to sea and to water checkdams across oueds, during flood surges.

The production of this waste per inhabitant is about 0.48 kg/inh/day (State of the environment, 1996). It is 0.5 kg in Greater Tunis, 0.75 kg in Sousse, 1 kg in Sfax and can reach 2.5 kg/inh/day in towns such as Cartage or Sidi Bou Said.

The major environmental problems occur essentially at the level of waste treatment; the existing discharge sites are badly controlled and managed while problems are aggravated by toxic waste discharges from various industries.

A vast programme to create controlled waste sites has been launched (25 controlled landfills are planned). The dump in the capital is already functioning. Other initiatives relate to the selective sorting of waste (pilot project at El Khadra) and composting (site at Henchir El Jahoudia).

Urban transport consists of private cars (36 % in Tunis, 49 % in Sousse, and 35 % in Sfax), public transport and bicycles. Road density reaches 1 km/km² around Tunis whilst the national average is only 70 m/km². The evolution of the car fleet, (410,000 vehicles of which 67 % are private cars) as well as their age (82 % of vehicles are estimated to be over 10 years old) constitute a threat for the atmospheric pollution of the major coastal cities (Tunis, Sfax, Sousse), which could get worse in the future. The main pollutants are Volatile Organic Compounds (VOCs) nitrogen oxide, and carbon monoxide, which respectively account for 73 %, 67 % and 58 % of total emissions.

Improved management of space allocation to urbanisation and of the proliferation of anarchic dwellings on the outskirts of towns is necessary, in order to better distribute human settlements and thus relieve the pressure exerted on areas sensitive to the degradation of their environment (coast, fertile agricultural land).

Finally, the strengthening of communes' finances is a major challenge, so that they can fully play their role in the development and supply of services and in urban management.

National urban development strategy

This national strategy is articulated around six major issues:

- Organisation - based on statistics reliable for planning uses - of the "urban territory" in a harmonious fashion allowing for a higher efficiency of the role of spaces for residence, activities, exchanges.
- Co-ordination and decision structures. Various services are responsible for urban development and management, often without any coherent scheme. The ideal would be to resort to a urban authority; for the moment the Regional Council will oversee the implementation of urban policies. This authority could be strengthened by an urban agency in charge of supervising urban studies. The Interministerial Committee for Land Use Planning (Comité Interministériel pour l'Aménagement du Territoire - CIAT) decides about major programmes for development, infrastructure and equipment.
- The integration of actions taken within urban boundaries. In order to bring together sectorial approaches, all actors would be mobilised around a "urban project" in harmony with the overall guidelines of the land use scheme.
- Inter communal co-operation. With the development of neighbouring communes, their mutual co-operation is essential to facilitate implementation of common tasks: waste management, development and management of equipment of common interest (controlled public waste dumps, slaughterhouses, etc.) The efficient functioning of this type of co-operation requires the definition of functioning methods, management and financing.
- Resource mobilisation and financing. In order to multiply financing possibilities for urban infrastructures, the following actions are provided for: improved collection of local taxes; users contribution for services rendered which should develop so as to better reflect costs; enlargement and generalisation of private sector resource mobilisation so as to improve global performances (sub-contracting of operations).
The financing mechanisms will be based in the short-term on consolidation of present mechanisms (choice of the 9th Plan) and in the longer term, on a less "administered" system based on the commune's own resources.
- The clarification of the role of urban actors in view of adapting to the new context. The role of the State is thus to regulate, develop infrastructure, national equipment and implement social policy. The trend will be more towards local authorities involvement and private sector support. The urbanisation documents now produced by central departments should be established by local technical structures.

Regional councils and communes are called upon to increase their respective roles concerning co-ordination and coherence between planning and urban management as well as in financing investments; they should base themselves on a partnership with the State, between local authorities and with the private sector.

The role of the private sector should grow substantially in the supply of infrastructures, equipment and urban services.

RURAL DEVELOPMENT

At 3.425 million people in 1994, although the rural population is tending to stagnate, and is expected to drop to 3.4 million in 2000, Tunisia remains a country marked by its rural character. Rural population accounts for 40 % of the national total and contributes to less than 20 % of GDP.

Agriculture represents the leading activity in rural and semi-rural areas and employs about 417,000 persons (43 % of rural and semi-rural employment). Construction, public works and indirect activities employ about 303,000 persons, representing 31.5 %. The remaining 241,000 are distributed between services and other occupations, i.e. 25.1 % (National Land Use Strategy, 1997).

The numerous rural population exerts high pressure on limited and fragile natural resources. The objective sought by Tunisian rural development policy is both the improvement of population's life conditions and the preservation of natural resources. The challenge is to reverse the process of natural resource degradation, whilst ensuring suitable incomes to an impoverished population. The way is to diversify non-agricultural income sources and intensify agricultural activities within the limits of resource constraints.

Evolution of rural development approaches

Since the 1970s, rural development has been addressed within five-year plans. For over a decade (1970-1980) partial solutions based on sectorial approaches were put forward for promoting employment and improving of incomes of an impoverished population. Results obtained did not reach objectives and natural resources continued to degrade.

Therefore, starting in 1984, the State was led to draw up Integrated Rural Development Programmes (Programmes de Développement Rural Intégré - PDRI) to reconcile natural resources protection and production. Some indicators show the positive impact of these programmes on improving the rural population's living conditions (between 1984-1994):

- the proportion of rudimentary dwellings dropped from 8.8 % (1984) to 2.7 % (1994);
- the rate of electrification increased from 29.3 % to 63.7 %;
- the percentage of the population with access to drinking water increased from 49.4 % en 1984 to 68.3 % in 1994.

Profitability results were equally encouraging as was the governorates' experience in managing PDRI projects. All this was reached despite the absence of an integrated development strategy, of a system for programming, monitoring and assessing, of commitment of the target population and women marginalisation.

As a result of this experience, a second generation of PDRI's was programmed for the 8th Plan (1992-96). It was based on an integrated and participatory approach. The change coincided with the disengagement of the State in favour of private activities and the promotion of basic popular organisational structures.

The second generation of rural development programmes

The second generation of Rural Development Programmes, launched in 1993, was conceived in harmony with all the natural resources sectorial strategies (soil and water conservation, forest and pastoral development, water resources mobilisation), and well integrated into strategies to combat desertification and conserve biodiversity. Main objectives are the protection of the environment, in particular natural resources, the economic and social development of rural areas and the reduction of regional disparities.

The programme includes numerous projects identified at the regional level, each project comprises a set of actions aimed at the reasonable exploitation of natural resources, the development of agricultural activities, the equipment of areas concerned with basic infrastructure for water supply, electricity, roads and telephone.

Regions that have benefited most from the PDRI are the Northwest and the Centre west where natural resources degradation and poverty go hand in hand. The allocation to the new programme for the 1993-1998 period amounts to 200 million TD distributed between productive agricultural activities (110.7 million TD), non-agricultural productive activities (6.8 million TD), basic infrastructure (99 million TD), operations and studies (3.5 million TD).

Decentralisation of this programme has allowed covering all regions; even the coastal governorates have been allocated credits for hinterland rural areas where employment is scarcely developed.

Actions for agricultural development concern the creation of small-irrigated perimeters by means of dugwells and borewells, the development of fruit tree cultivation, the acquisition of livestock to integrate into farms, the improvement of pasturelands, the development of forage plantations to promote animal husbandry and above all logistical support to farmers.

Basic infrastructure has been designed to develop services (marketing, packaging), create artisan skills, develop trading activities and facilitate income diversification.

The success of the PDRI depends on the involvement and responsabilisation of the beneficiaries, on the development of planning, monitoring and control of development actions. At present, units of the General Commissariat for Regional Development (CGDR)⁹ and the Regional Commissariat for Agricultural Development (CRDA)¹⁰ are charged with carrying out this task.

The stimulation of economic activity in the rural environment requires the solution of complex property problems, the encouragement of socio-economic groupings and community institutions (Collective Interest Associations - AIC, Collective Interest Forestry Associations - AFIC, regional rural and village councils...), the adaptation of the institutional and legal framework to rural development, as well as the implementation of a monitoring and evaluation system.

Concerning monitoring and evaluation, indicators showing rural development impact on natural resources need to be developed. Only the monitoring of the piezometric level of some but not all aquifers is carried out at present. Changes in vegetation and soil cover have not yet been systematically assessed and simple qualitative observations predominate in monitoring.

⁹ CGDR : Commissariat Général de Développement Régional

¹⁰ CRDA : Commissariat Régional de Développement Agricole

The National Solidarity Fund - "26-26" (Fonds de Solidarité Nationale)

Despite progress in alleviating poverty alleviation and improving living conditions, illustrated by most of development indicators, concern persists about the extreme deprivation still prevailing, in particular in rural areas.

In order to remedy this situation, the National Solidarity Fund was set up in 1993 upon a President's initiative. Based on a tradition of mutual aid and solidarity, this fund is intended to mobilise new means so that development actions reach isolated areas and marginalised social groups.

The National Solidarity Fund is known under the name of "26-26", which refers to its bank account number. Its objective is to assist deprived people by improving their living conditions (electrification, drinking water, health installations, tracks, etc.) and by creating sustainable income sources.

The fund was set up to increase social transfers without upsetting the national budget balance. It is financed by voluntary donations from individuals, associations and organisations, which contribute to expanding its resources, apart from credits allocated from the State budget.

The achievements within the national plan for the promotion of backward regions since 1993 have benefited 928 zones, rural (60 %) and urban (40 %) areas, inhabited by more than 151,000 families.

Global investments of 366 million TD have been made, of which 88 % for infrastructure, and 12 % for income-generating projects in favour of more than 40,000 families. These income sources relate to agriculture, handicrafts, small trades and services.

The 1999 budget is more ambitious and provides for actions in 182 backward areas; credits exceed 92 million TD, of which 15 % are reserved to the creation of income sources for 9,191 beneficiaries. The other 85 % will be mobilised to improve infrastructure and social equipment.

To strengthen this orientation, a Tunisian Solidarity Bank (Banque Tunisienne de Solidarité) was set up in 1997 with a mandate to grant loans on favourable conditions in order to assist projects created by artisans, promoters of micro-projects and qualified persons without traditional financial means or collateral usually demanded by banks.

AGRICULTURE AND FISHERIES

During the last three decades, Tunisian agriculture has continued to develop through the continued effort to improve production means, property auditing, structures and profession organisation, by encouraging investments and adopting a market-based pricing policy. These changes, together with major attention to the rational natural resources management to ensure their sustainability, resulted in an average growth rate of 4.5 % during the last decade. The performances of the agricultural sector are undoubted; in less than thirty years and despite the climatic vicissitudes, cereals and milk productions have doubled, meat production has risen by 250 %, whilst market garden production has tripled.

Following this trend, will Tunisian agriculture be able to take up the challenge of food self-sufficiency whilst respecting the requisites of ecologically sustainable development? The challenge is threefold:

- Food security, conditioned by obtaining a sustained positive balance on the food trade account, requires the promotion of agricultural and food products exports, and the guarantee of placing agricultural products on the local and international market by acting on quality and prices.
- The success of the upgrading programme for the agricultural and fishery sectors, by acting on the production and quality of products while lowering production costs.
- The continuation and improvement of natural resources conservation strategies to ensure their maintenance, and even the improvement of their productive capacity.

Characteristics of agricultural development

Fluctuations in agricultural production linked to climatic conditions were strongly attenuated after the development of irrigated perimeters and the diversity of cultures (tree crops, annual crops, forage crops) and animal husbandry (beef cattle, sheep, poultry, rabbits...). These now ensure a certain stability in agricultural production.

Increased mechanisation has reduced the proportion of workers employed in agriculture and fisheries; on the other hand the employment in services linked to this sector and in the agrifood industry has increased substantially.

The option for a progressive disengagement of the public sector in favour of production by the private sector, supported by the structures of the profession (chambers of agriculture, services co-operatives, Collective Interest Associations) is now operational. However, land use and the necessary balance between various productive sectors (balance between vegetation resources and livestock numbers) remain the responsibility of the State.

Despite State efforts to develop soil and water conservation in the agricultural areas, erosion continues. The incentives to implicate the farmers in soil conservation at farm level have little effect. The introduction of the participatory approach to create a partnership between the farmer and the administration for sustainable management is still timid and needs to be strengthened.

Water resources reserved for agriculture are subject to major losses at the level of distribution and the farm where they are still used very inefficiently.

As regards vegetation resources, besides overgrazing and impoverishment of pasturelands, the generalised use of selected high-yielding varieties has resulted in the abandonment of a number of local species and the reduction of agro-biodiversity (varieties of barley, melons, lucerne...).

Other very varied problems affect agricultural development, essentially:

- Real estate problems relating to the regularisation of land tenure by registration, the absence of ways to secure indirect rights, joint-ownership problems, fragmentation...;
- Small farmers' difficulties in accessing credit;
- Prices which play a major role in the decision-making process of producers;

- Technical approaches often ill-adapted to the development of crops and the correct management of natural resources.

The institutional apparatus - composed of central technical directorates, regional commissions for agricultural development and support, and research and training institutions - works to reduce these inadequacies and to develop the sector. The development context is often marked by the lack of assistance, of extension services and of other means to act more rapidly and efficiently.

Trends in agricultural production

The implementation of 10-year strategies for the protection of natural resources, and efforts undertaken in all areas to improve agricultural production (modernisation of agriculture, training, popularisation, dissemination, credits etc.), have resulted in encouraging average results, from one plan to another:

Development of annual production

Production (x 1000 T)	Average during 7 th Plan (1987-1991)	Average during 8 th Plan (1992-1996)	Growth rate %	Average expected during 9 th Plan (1997-2001)	Expected growth rate %
Cereals	1383	1607	16	1820	13.2
Olive oil	563	740	31	890	20
Citrus	228	209		243	
Summer fruit	286	391		490	
Dates	71	77		95	
Potatoes	183	217	18	326	50
Tomatoes	453	507	11.9	691	36.2
Other vegetable	844	941		1177	
Red meat	162	181	11.7	227	25
Chicken	63	88		101	
Eggs (10 ⁶)	999	1065		1245	
Milk	385	526	36.6	742	41
Fish	95	86		99	

Source: 9th Plan

According to data on the 9th Plan, the production of basic products (cereals, olive oil, meat, milk, and vegetables) has on average developed positively between the 7th and 8th Plan, thus meeting the objective of food security. However, unless the water conservation strategy yields significant results, the forecasts for increased vegetable production between the 8th and 9th Plan are optimistic considering the scarce water resources.

Concerning investments, 3,022 million TD were spent during the 8th Plan and 4,730 million TD (1996 constant prices) have been allocated for the 9th Plan (1997-2001).

The equipment budget of the Ministry of Agriculture has increased very rapidly, especially the credits set apart for natural resources.

Equipment Budget of the Ministry of Agriculture (million TD)

	1987	1991	1994	1995	1996
Total equipment budget	210	270	277	323	346
Conservation of natural resources	54.6	99.9	115	148.1	186.2
Investment as % of equipment budget	26 %	37 %	41.5 %	45.8 %	53.8 %

The efforts performed for natural resources conservation (soil, vegetation) and for water resources mobilisation are significant under the two most recent plans for economic and social development. As a percentage in relation to the total equipment budget, this effort has gone from 26 % (1987) to

53.8 % (1996); in terms of direct investment this has increased from 54.6 million TD to 186.2 million TD, i.e. has tripled.

The fishery sector

The average catch during the 6th Plan was 95 000 tonnes. During the 7th plan (1992-1996), this average fell to 86,000 tonnes. The biggest catch was attained in 1988, year in which it exceeded 100,000 tonnes.

Fishing is mainly concentrated in the Southeast, which accounts for nearly half of output, resulting in the overexploitation of the Gulf of Gabes. The North remains underexploited despite a series of State incentives.

The sector occupies a large labour force: 60,000 direct and 40,000 indirect jobs. Major investment efforts have developed the infrastructure (43 harbours, and more than 11,000 fishing boats...) well spread over the 1300 km. of coast.

On the basis of studies of the Institute for Marine Science and Techniques (Institut des Sciences et des Techniques de la Mer -INSTM), which have highlighted the continuous decline in fishstocks, the State has taken measures to develop fisheries in the still underexploited North of the country and to relieve the pressure on the Gulf of Gabes. These measures included issuing a law and implementing decrees for the protection and control of fishery resources (at the level of investments and exploitation).

The rationalisation of fisheries according to available fishstocks, and the introduction of the idea of biological pause for certain species could ensure the sustainable development of the sector.

Since fishery produces a product in great demand in the large European Union market, the State has continuously encouraged this sector by upgrading production and marketing structures in order to improve yields and profit margins, as well as export promotion. The country will be increasingly faced with a double challenge: to increase production and improve productivity as well as to solve the vital question of safeguarding resources and potential.

TOURISM, A DRIVING ECONOMIC SECTOR

The tourism sector occupies a major place in the national economy, accounting for about 5.5 % of GDP. It is the second largest export sector after textiles, and employs 70,000 people. These figures do not include the employment induced in other economic sectors (transport and handicraft). The impact of its development has spread beyond its frontiers. In 1960, Tunisia only received 0.2% of the Mediterranean tourists, nowadays Tunisia hosts 5.5%.

Accommodation has increased from 4000 beds in 1962 to 170,000 in 1996, 200,000 in 2000, with capacity for 2015 forecast at 300,000 beds.

The tourism sector has based its development on a foreign, mainly European clientele, which is also attracted by other Mediterranean countries (Spain, Portugal, Italy, Turkey, Morocco..). The survival of Tunisian tourism is a function of the highly competitive international environment, in particular as regards competition from Portugal and Turkey, and to a lesser extent from Morocco and Egypt.

The concern on this competition requires diversification of the tourism product (seaside, Saharan, international meetings, culture, sports...) in order to attract a varied clientele. On the basis of this assessment, the State has created a fund --financed by the sector itself-- reserved for the development of sectorial capacities to face up to competition.

In order to guarantee the durability of ever more demanding clients, another essential challenge for the sustainable development of the sector is to promote a quality product; especially the availability of well organised services.

Tourist activities are essentially developed along the coast and concentrated around the Nabeul-Hammamet, Sousse-Monastir and Jerba-Zarzis centres. Uncontrolled tourism and other developments along the coast contribute to the degradation of a highly sensitive environment. The planning of residential zones for tourist personnel has been neglected, contributing to the multiplication of peri-urban areas of spontaneous dwellings. Beaches erosion and pollution of bathing water are serious threats to a tourist product the promotion of which is based on the beauty of the sites and the cleanliness of the environment of seaside resorts.

National tourism is already well developed, and can only increase with the growth of holiday travels by Tunisians, Algerians and Libyans. It is difficult to compute since most stays are with relatives, friends or in holiday homes.

Agriculture has lost a significant potential due to the wasteful use of space by tourist developments on the coastal plains. These plains were amongst the most fertile in the country. There is also pressure on arable land due to real estate speculation (Djerba, Hammamet) on the fringes of tourist areas.

Tourism development and environmental protection

Nowadays, the environment is considered as an essential part of the tourist product and the quality of the environment increasingly influences tourists' destination. Under this new situation, several actions have been undertaken to promote tourism respectful of the environment.

- Establishment of a special fund, financed by professionals, for environmental protection projects in tourist centres;
- Establishment of master plans for tourism development by the Ministry of Tourism. These plans take into account the specific characteristics of regions and the integration of tourist establishments within their natural and urban environment.
- Concerning equipment and improved tourist environment, a national programme to protect the coast against pollution ("Main Bleue" - Blue Hand) has been adopted. It involves the construction of around 30 water treatment plants to irrigate golf courses, the setting up of 11 controlled waste dumping sites, the extension of waste pipes into the sea to evacuate excess purified water, the elimination of sea dumping or polluting industrial wastes by the construction of pre-treatment stations allowing the complementary treatment of these waters before their arrival at the water treatment plants.

INDUSTRY AND MANAGEMENT OF INDUSTRIAL POLLUTION

Industrialisation efforts in Tunisia have known two eras: during the 1960s and 1970s, there was no consideration of environmental aspects, whereas starting at the end of the 1980s the environment was seriously taken into account.

Indeed, during the last ten years, economic growth has been stable and sustained by spectacular industrial growth accounting for 30 % of a steadily increasing GDP (4.6 % p.a. during the 8th Plan). The added value of manufacturing industries reached an annual average of 6 % during the same period. This was obtained owing to the multiplication of industrial establishments, varying between 9,000 and 10,000, employing about 300,000 persons.

On the environmental level, from the creation of the Ministry for the Environment and Land Use Planning (1991), action plans to combat industrial pollution emerged; on the industrial level, a global and integrated strategy was launched to upgrade industrial structures.

The major challenge for the State and industrialists is to promote competitive industrial development on both the national and export markets, while scrupulously respecting the requirements of the environment.

The rapid development of industry and its concentration in urban poles has led to the emergence of industrial pollution with negative impacts on health of a large population. The challenge is to

reduce this pollution without however reducing an industrial growth that creates jobs, i.e. to develop a clean industry.

Industry and pollution

The most important industrial activities in Tunisia are textiles and leather (37 % of industrial facilities, 51 % of industrial employment), food processing, building materials, electrical and engineering, chemical and other small industries. During the 9th plan the sector aims to achieve a growth rate of 6.9 % per year (5.8 % for the 8th plan) and to increase exports by 11.8 % per year (10.9 % under the 8th Plan).

Twenty-five per cent of enterprises are concentrated in Greater Tunis, in its industrial zones of Chargaia, Ben Arous, Megrine and Bir Kassâa. To this industrial concentration around the capital are added the poles of Bizerta (petrochemicals), Menzel Bourguiba (steel), the Sahel of Sousse-Monastir (textiles and various), Gabès (chemicals), Sfax (small and medium industries), Gafsa (phosphates) and Kasserine (esparto paper pulp).

Out of a total of 10,000 industrial units, about 1,200 are classified as polluting ones. These relate to the following sectors: chemicals, tanning, food processing, extraction, paper processing, cement, energy production and textiles. These activities are mainly situated on the coast, and produce pollutants of varying nature and intensity.

A range of institutions (MEAT, ANPE, APAL, ANER, and ONAS) is mobilised to combat industrial pollution, backed by extensive environmental legislation.

World Bank studies on pollution (Economic growth and ecological sustainability in Tunisia, 1995) evaluated the contribution of each individual activity to the pollution of air, water and soil and quantified other pollution indicators.

Contribution of industrial activities to pollution (%)								
	Air	Water	Soil	BOD	SPM	SO ₂	NO ₂	VOC
Food products	1.41	2.16	2.95	52.84	1.08	6.15	9.58	4.98
Pulp and paper Industries	6.72	9.18	1.48	21.32	5.86	6.30	5.39	3.56
Chemical industries	36.41	69.20	50.36	17.85	2.60	10.05	17.24	26.18
Other chemicals	16.37	2.55	10.12	0.66	5.44	5.01	3.02	11.78
Hydrocarbons industry	2.97	1.22	6.87	0.85	0.35	10.84	9.69	17.83
Other products: non-metallic minerals	5.16	0.47	4.14	0.27	0.37	39.09	34.33	3.55
Iron and steel industry	4.62	8.94	14.45	0.07	82.28	14.67	9.90	6.10

Source: World Bank, 1995

The analysis of obtained results leads to the following observations:

- The high share of NO₂ in air pollution demonstrates the inefficient techniques used in industry and the age of rolling stock;
- The chemical industry has contributed greatly to air, water and soil pollution;
- The food industry is a major actor in water pollution since it constitutes the principal source of organic matter responsible for the increase of BOD;
- The iron and steel sector is a major polluter due to the high emissions of suspended particulate matter.

Managing industrial pollution

Taking into account the impact of industrial development on employment, the State has emphasised priority sectors such as manufacturing industry, without however neglecting measures necessary to combat the pollution it generates. Moreover, the national objective to promote industrial exports requires that enterprises conform to strict environmental standards.

The programme to combat industrial pollution, drawn up immediately after the creation of the National Agency for Environmental Protection (Agence National de Protection de l'Environnement - ANPE) and of the Ministry of the Environment and Land Use Planning (MEAT) is based on three principal components: prevention, pollution reduction, and control and technical assistance for clean industry.

Impact and pre-treatment studies. Prevention is based on respect for rigorous legislation favouring the development of a non-polluting industry. A presidential decree instituted the obligation for an Environmental Impact Assessment of all industrial projects before they are carried out. The EIA emphasises all the negative impacts of the project affecting the environment and people's quality of life and proposes necessary measures to reduce those impacts. The acceptance of the project depends on the ANPE, in charge of assessing the gravity of the project's environmental impacts and the feasibility of measures required to combat pollution. Over 1,000 EIAs have been carried out with an approval rate between 60 and 70 %.

Land use planning to contain pollution. Land use planning and allocation of space are of capital interest in combating pollution. The creation of industrial zones within a restricted area with the least negative impact on the natural environment and natural resources constitutes a pollution prevention operation. Moreover, the fact of bringing together industrial units into the same space facilitates the management of both liquid and solid wastes.

The pollution reduction programme concentrates its activities on the identification of sectors and regions threatened with pollution, on the establishment and implementation of action plans for reducing or eliminating pollution and on the encouragement of anti-pollution operations by means of economic incentives. Pre-treatment studies for existing projects and new projects in order to have acceptable wastes in reception areas have multiplied following financial incentives granted by the anti-pollution Fund (Fonds de Dépollution - FODEP).

FODEP intervention. The anti-pollution fund is a financial instrument aiming at strengthening the curative component of the MEAT strategy, encouraging environmental protection projects, and assisting in the creation of waste collection and recycling units.

FODEP assistance is granted by means of a subsidy (up to 20 % of cost of installations) to all projects destined to reduce and eliminate pollution of polluting industrial units, in particular old ones. A proportion of 30 % of costs must be covered by the industrialist's own resources and the rest, i.e. 50% is often financed by bank credit, managed by State accredited banks.

About 5,500 industrial establishments require waste pre-treatment. The number of pre-treatment studies submitted to the ANPE for approval is steadily increasing (93 applications in 1993, 638 in 1995, 1110 in 1996).

Control and technical assistance. The MEAT through the ANPE carries out the continuous inspection of industrial units. On the one hand, this control allows an assessment of the situation and the selection of polluting sectors needing studies and technical assistance in order to propose practical solutions for managing this pollution. On the other hand, it allows to fine establishments infringing the law. The number of writs issued has greatly decreased in recent years due to preventive anti-pollution operations.

Depollution of large polluting units. The 1,200 or so classified polluting establishments are distributed between the phosphate industry and derivatives, cement, pulp and paper, sugar, textiles and leather, hydrocarbons, electricity production, and iron and steel and metals processing.

MEAT priority interventions focus on the most polluting sectors, dictated by risks run by the inhabitants living next to the polluting units. During the 8th Plan expenditures for industrial anti-pollution actions amounted to 118 million TD. This amount, considered to be relatively low, was increased to 406.4 million TD during the 9th Plan (forecast).

- For the phosphates industry and derivatives, an anti-pollution plan for the cities of Sfax and Gabes resulted in a sizeable reduction in the amount of toxic emissions from phosphate processing industries. For the phosphogypsum wastes, studies carried out on removing

pollution from the Gulf of Gabes came up with a solution consisting in dumping solid wastes into a controlled landfill near Sabkhet El Melah, 20 km away from the phosphate processing plants. This dumpsite will be constructed during the 9th Plan.

- For the cement industry, the reduction of pollution consists in good maintenance of equipment and in particular of filters. At present, most cement plants have difficulty in maintaining their equipment in normal and optimal emission conditions.
- For the hydrocarbons industry, various actions have been carried out since 1990, in particular the construction of a reservoir for the deballasting of oil tankers, a new basin for removing oil from waste water containing hydrocarbons, and a storage basin for sludge collected; other studies are underway for the treatment of residual water.
- For the pulp and paper industry, the conversion is underway of the chlorine production process required to whiten paper during processing, and this could avoid mercury wastes which functioned as cathode in the previous process of electrolysis for chlorine production

Depollution of industrial areas. This programme concerns major public sector industrial complexes, in particular those of Gafsa, Gabès, Bizerte, Sfax and Kasserine. Large investments have resulted in pollution depletion.

At Ben Arous, a suburb in the south of Tunis, out of 170 polluting plants, nearly half have already installed pre-treatment systems and the other half is prepared to follow. After these operations, it is possible to connect these industrial plants to the South Meliane purification station.

In the Sfax industrial zone, two-thirds of polluting industrial establishments are already equipped with anti-pollution systems. Large investments are planned to link industrial plants with pre-treatment facilities to the Sfax purification station.

Curbing atmospheric pollution in the Gabes industrial zone is advancing as a result of the installation of necessary equipment.

For the most polluting units, a grouped station is needed which can treat wastes containing heavy metals. This is an on-going priority project for all industrial areas. It started in 1996, with the German technical co-operation (GTZ) and it aims to revise water quality standards, to identify industrial units, training, information, awareness-raising and technical assistance to industrialists.

4. Main stakeholders

PUBLIC ENVIRONMENTAL INSTITUTIONS

Six years after the UN Conference on the Human Environment in Stockholm (1972), awareness of environment problems was reflected in Tunisia by the establishment of the National Environment Commission (Commission Nationale de l'Environnement - CNE) as the co-ordinating mechanism responsible for defining and establishing a global environmental policy within the framework of economic development plans.

Several technical departments subsequently set up directorates for environmental issues concerning them, the most important of which were those of the Ministry of Agriculture, of the Ministry of National Economy (associated to Standardisation and Quality Control), of the Ministry of Equipment (General Directorate for Land Use Planning) and the Ministry of Health (with environmental health).

Well before this, the National Sanitation Office (Office National d'Assainissement - ONAS) had been set up in 1974, to solve the problem of sanitation of urban industrial and tourist areas and to manage the entire sanitation sector at the national level.

Other very old institutions, dating from before independence (1956) and under the Ministry of Agriculture, are directly involved in managing natural resources through:

- the General Directorate for Forests (Direction Générale des Forêts - DGF) for vegetation resources (forests and pasturelands coming under the forest regime),
- the General Directorate for Water Resources (Direction Générale des Ressources en Eau - DGRE) for underground water resources as well as monitoring and measures relating to surface water;
- the General Directorate for Studies and Major Hydraulic Works (Direction Générale d'Etudes et Grands travaux hydrauliques - DGEETH) for the mobilisation and management of surface water resources (lakes and dams),
- the National Company for Water Management and Distribution (Société Nationale d'Exploitation et de Distribution des Eaux - SONEDE) for managing drinking water;
- the Directorates for Soils and for Soil and Water Conservation, for soil management.

Research institutes, also under the supervision of the Ministry of Agriculture, are in addition associated: the National Research Institute for Rural Engineering, Water and Forests, (INRGREF), the National Institute for Agronomic Research (Institut National de Recherches Agronomiques - INRAT), the National Agronomic Institute of Tunisia (Institut National Agronomique de Tunisie - INAT), the Sylvo-Pastoral Institute at Tabarka (Institut Sylvo-Pastoral de Tabarka - ISPT). These bodies assist the others in their management task by offering technical solutions and resource management approaches.

Although these institutes only depend on one department (Ministry of Agriculture), they retain their sectorial character.

The National Environment Protection Agency (ANPE), 1988

The establishment of the ANPE in 1988 filled an institutional gap and was the departure point for an era marked by environmental activities. Assisted in its initial stages by officials from ONAS as well as from the Ministry of Equipment and the Ministry of Agriculture, ANPE undertook to consolidate its structure for carrying out a double mission:

- Analysis of the state of the national environment by diagnostic studies,

- Combating all sources of pollution and degradation by preventive actions (impact studies, awareness raising, environmental education) and curative ones (pollution control, enforcement of environmental legislation).

In addition, ANPE has the mandate to:

- Participate in the establishment of national strategies for combating pollution and protecting the environment;
- Act to prevent and combat all types of pollution and threats to the environment;
- Act in favour of the rational exploitation of natural resources with a view to sustainable development;
- Instruct approvals for investments in any project aimed at combating pollution and protecting the environment;
- Participate in the establishment of a national emergency and intervention plan for accidental pollution events or external risks threatening the environmental equilibrium and life support systems;
- Evaluate the environmental impacts of new agricultural, commercial and industrial projects;
- Establish regional offices to facilitate contacts with citizens and manufacturers and to ensure monitoring and control of the state of the environment;
- Promote actions for awareness raising, education, studies and research in pollution control and environmental protection;
- Manage projects relating to the management of solid wastes, urban parks, natural parks and protected areas;

The Ministry of the Environment and Land Use Planning (MEAT), 1991

Environmental management is a very delicate task since it interferes with the activities of most government departments (Interior, Industry, Trade, Agriculture, Public Health, Capital Works, Social Affairs, Foreign Affairs).

Were the MEAT to substitute the environmental activities of all these departments it would be a mega-ministry: if it were to limit its task to planning, co-ordination, awareness-raising and supervision, a Ministry with a light structure could ensure environmental management more efficiently. MEAT was created according to the second option; for the same reason it was charged with Land Use Planning so as to ensure a rational management of space, in harmony with the environment. Spatial planning of the infrastructure of future human settlements and urban industrial and tourism areas, contributes to minimising environmental degradation.

MEAT is responsible for:

- Proposing in collaboration with other ministries and bodies concerned, the State policy for protecting the environment and nature, for improving living conditions and land use planning, and for overseeing its implementation;
- Promoting legislation for environmental protection, nature conservation and land use planning;
- Co-ordinating actions between the different actors involved in managing the environment and preserving natural resources at national and regional level.

The organisation of the Ministry's external services was based on divisions for the national territory related to the natural characteristics of the regions. Six regional directorates were established for:

- the coastal area, distributed among three regional directorates: northern, central and southern coast;
- the northern plateaux and plains;
- the central steppes;
- the Saharan south.

These regional directorates for the environment and land use planning are responsible for supervising the environment in the region, monitoring environmental projects, implementing land use plans and providing technical assistance to local communities.

Until now, environmental awareness-raising and education activities have been very effective and crowned with success. On the other hand, activities related to monitoring and assessment have given rise to a certain unease in other ministerial departments (Agriculture, Interior, Equipment).

The presence of the Ministry of the Environment in planning operations and in preparing national development and social programmes that relate to the environment, is not significant. This is due on the one hand, to a certain routine acquired by the older departments that gives preference to sectorial work instead of co-operation (interministerial) work; on the other hand, to the lack of officials in the Ministry of the Environment to contribute to the many projects under the responsibility of other departments.

Public bodies under MEAT supervision

Apart from ANPE, the various institutions under MEAT make up an efficient technical structure for environmental protection.

National Sanitation Office (ONAS). Set up in 1974, ONAS is the main actor in urban sanitation, with its mission to protect the water environment in urban settlements being extended to the entire country. At present it intervenes in 135 communes¹¹ ensuring the construction and running of sanitation works. Sanitation in other urban areas is carried out by the municipalities themselves.

Since sanitation of urban areas is an increasingly heavy task, a strategy is being studied for the transfer of sanitation activities from the public to the private sector.

A pilot experiment was launched in 1997 with the entry of a private operator. A second operation for the rehabilitation and running of treatment plants is underway.

Increased private sector participation should be translated into a reduction of running costs, improved quality of service, investment of additional capital, creation of a local market for management services.

The sustainable development of the sanitation sector inevitably implies integrating the private sector, containing charges and cost recovery from users, respecting of environmental and development requirements, and using technologies adapted to the users' payment capacity.

Agency for Coastal Protection and Planning (APAL) Established in 1995, this agency is responsible for applying the State policy to protect the coast in general and the public maritime domain in particular. To better manage coastal spaces, to monitor and co-ordinate land use operations, to correct illegal property situations, make up its mission. Moreover, it must undertake all studies, research and expertise relating to coastal protection and upgrading natural areas, and monitor changes in ecosystems. (see also chapter on "Coastalisation").

International Centre for Environmental Technologies (Centre International des Technologies de l'Environnement - CITET). Established in 1996, the CITET's mission is to acquire, adapt and develop new techniques, to promote eco-technologies and their production, to build up national capacities and to develop necessary scientific knowledge to work out and develop environmental techniques appropriate to specific national and regional needs. Breaking with the purely scientific or industrial approach, the CITET integrates research and development, efforts made by industries and enterprises, and training. It combines technology with the creation of capacities and facilitates co-operation between various development actors, especially between the scientific and technological community and the productive sector.

¹¹ There are 257 municipalities in Tunisia.

The training centre for environmental management, one of the most important elements of the CITET, is a Tunisian-German project already launched on the basis of objectives defined at the end of 1994, during a planning workshop.

National Renewable Energies Agency (Agence Nationale des Energies Renouvelables - ANER). The original agency for energy management set up in 1985 was recently attached to MEAT under its new name. Its mission is to promote renewable energies and restrain energy consumption by drawing up energy conservation plans while reconciling development and the protection of the environment against atmospheric pollution.

From the beginning of the 1980s, Tunisia adopted an integrated energy and environmental policy based on three goals: to rationalise energy consumption; to modify the consumption structure by type of energy, especially in favour of gas, which is a cleaner form of energy; to develop the use of renewable energies, in particular solar energy. The agency's investment programme provides for a saving of 1.1 million Toe/year as from 2010.

SOCIETY AND ENVIRONMENT

Efforts in environmental awareness raising and education

Since the creation of MEAT in 1991, environmental awareness raising and education have been preferred actions, carried out in collaboration with other bodies concerned (National Education, Interior, Agriculture, Health...).

Many actions have been undertaken, mainly awareness-raising campaigns during the many commemorative days (National and international Environment Day - 5th June, the national and international Water Day - 22nd March, the spring of the environment, the Tree Festival in November, the national cleanliness week from 5th to 11th June, the Blue Hand ("Main Bleue"¹²) campaign...).

Other awareness-raising actions have been organised throughout the year: producing documents for children and youth on various environmental issues, strengthening of environmental information via the media (radio and TV), organising exhibitions and visits of the Minister to various educational and cultural institutions.

Educational programmes targeted on environmental protection have been inserted into primary and secondary school curricula. In parallel, environmental education activities have been undertaken in the extra-school area through youth centres and environment clubs spread throughout the country

In order to support environmental awareness raising and education activities, training courses for teachers and environment club leaders are regularly organised, especially during the school holidays in winter, spring and summer.

Public attitudes and behaviour

The impact of these efforts on the behaviour of the general public is visible through certain qualitative indicators emerging from surveys by the ANPE.

One such indicator is the public's reaction to the various pollutions. The MEAT's office for public relations with citizens daily receives 5 to 10 complaints about damage to the environment (unhealthiness, noise, degradation of natural milieu, etc.). There are increasing reactions to waste thrown on public ways, according to the image of "Labib" (the environment mascot) who, in a television spot, intervenes to correct polluters.

¹² "Main Bleue" : - Blue Hand. Programme to combat water pollution

Beyond the effects of environmental awareness-raising and education programmes, Tunisian people are impregnated with a religious culture that condemns waste or any action leading to the degradation of nature; Tunisians are especially sensitive to the need to save water as shown by the saying "a drop of water is worth more than a treasure". In the arid region, parents continue to transmit values of conservation of forage flora to protect pasturelands. Despite the high value of wood production of certain pastureland flora, their eradication is considered by tradition as an act of profanation.

ANPE conducted a survey on a sample of 1,000 persons to evaluate the impact of awareness-raising campaigns on the general public. The results revealed that the television productions or the "Labib" spots have more impact (81% of viewers) followed by programmes such as "We and the environment" (57%) and clips (34%). The MEAT/ANPE written productions only reached 23% of the population with a key role for posters. The survey also showed the great popularity of the Tree Festival, observed by almost 90% of Tunisians. The Environment Week (5-11 June) and the "Main bleue" campaign have a considerable audience (43% and 33%). However, the audience for radio productions appears rather small.

The success of awareness-raising campaigns is explained by the novelty of the environmental field, which arouses interest and curiosity. These campaigns usefully treat subjects that affect the general public in its daily life, such as pollution and health risks.

The younger generations are the most involved, as shown by their willingness to take part in campaigns to rehabilitate their neighbourhoods or to pay for environmental protection.

Finally, the increased involvement of government social partners (youth and cultural centres), parapublic organisations (scouts, women's movements, professional associations), NGOs (associations for the protection of nature and the environment, neighbourhood committees, environment clubs), shows a collective awareness of environmental concerns.

PARTNERSHIP AND INTERNATIONAL CO-OPERATION

Faced to problems of resource degradation (desertification, genetic exhaustion of marine and continental biological species) and of pollution and pollutants due to urban, industrial and transport development, Tunisia has over the years developed a co-operation policy with bilateral and multilateral active partners in the field of environment and development, well before the Rio Earth Summit of 1992.

Further to the Earth Summit recommendations and to the international commitments assumed there, Tunisia has since intensified its co-operation in areas that have become key points of this co-operation (combating desertification, protection of marine habitats, *in situ* biodiversity conservation, protection of water resources), and particularly in the sanitation field.

Also within the framework of the Rio recommendations, two countries, Sweden (1992) and the Netherlands (1994) have accepted to convert debt owed by Tunisia into environmental protection projects.

After signing and ratifying the main international conventions (Vienna Convention, Montreal Protocol, the UN Framework Convention on Climate Change, the Convention on Biodiversity, the UN Convention to Combat Desertification) and Mediterranean conventions (see table of conventions), Tunisia has developed programmes to implement all these international agreements, taking advantage of the possibilities of available aid and financial and technical assistance.

On the bilateral level, MEAT pursues technical and financial co-operation projects with Germany (seven technical co-operation projects, of which two studies, and four major financial co-operation projects relating to sanitation of cities in the Medjerdah watershed, the Bizerta area, protection of Lake Ichkeul and the Anti-Pollution Fund). Cooperation projects with Germany benefit from grant funds.

Moreover, the training centre for environmental management, one of the most important components of the International Centre for Environmental Technologies (CITET) is an operational Tuniso-German project.

Since 1993, MEAT has also co-operated with the Ministry of the Environment, Land Use and Agriculture of the German Land of North Rhine-Westphalia. A protocol signed then between the Tunisian and Westphalia ministers provides for the support of the Westphalia ministry to the Tunisian ministry in the fields of solid waste management (training of Tunisian officials in Germany, co-operation between German industries specialised in waste management and Tunisian industrialists), air pollution reduction (advice for establishment of a monitoring system and adequate regulations).

Tunisia has co-operation relations with Canada via the GEONAT project for the national geomatic strategy; the objective is to endow Tunisia with a numerical geographical information system, by making geomacy an important economic tool and making it contribute to sustainable development in Tunisia.

MEAT also has good co-operation relations with Sweden, Great Britain, France, Spain, Luxembourg and the USA (USAID project to assist privatisation of environmental services).

At the multilateral level, Tunisia has benefited from the financial and technical assistance of UN agencies for:

- Establishment of a national biodiversity conservation strategy;
- Establishment of a biodiversity inventory,
- Establishment of greenhouse gases inventory, promotion of renewable energies as well as energy management;
- Elimination of substances destroying the ozone layer;
- Establishment of a national fund to combat desertification.

Co-operation with the FAO is highly important, in particular in the field of integrated natural resource management. The most important projects relate to soil management, study of soil erosion and management of pasturelands, the "MEDRAP project".

The National UNESCO Man and the Biosphere Committee is at the origin of a number of sites being listed as biosphere reserves: Carthage, Ichkeul, Chaambi and Bou Hedma.

With UNDP, main co-operation activities have been:

- Implementation of an integrated programme on awareness-raising, information, education and training of specialised environment officials;
- The Environment and Sustainable Development Observatory (OTEDD) project aimed to endow Tunisia with capability to ensure the continuous monitoring of the state of the environment and sustainable development;
- The sustainable development network, a project to circulate information and communication to support the national Agenda 21 process and international conventions on sustainable development (combating desertification, biodiversity, climate change, etc.)

Co-operation actions have also taken place with the European Union, the European Investment Bank (EIB), the World Bank, both independently and jointly within the METAP programme. Moreover, Tunisia has benefited from the financing of two major projects and two smaller projects by the Global Environment Facility (GEF), as well as major financing from the EIB to reduce pollution for phosphate processing.

Through the MEAT, Tunisia endeavours to strengthen **regional co-operation**:

- With Arab countries to promote common actions to protect the environment;
- With countries of the Arab Maghreb Union with ongoing actions in particular in the area of sanitation;

- Within the Mediterranean framework, MEAT organised a Ministerial Mediterranean conference (MED 21, 1st November 1994) financed by the Ministry's various international partners. The preparation of the Med 21 conference and its results involved Tunisia even more in Mediterranean co-operation.

In view of the resulting decisions, the Med 21 conference was a turning point in the co-operation between countries and institutions of the region existing over the last 20 years, sustainable development having become the main co-operation axis between Mediterranean countries. Within this context, Tunisia intends to play a leading role in the establishment and transfer of eco-technologies, as the country already does for biodiversity --the Mediterranean Action Plan Regional Activity Centre on specially protected areas is based in Tunis.

Tunisian participation in international and regional environmental conventions

			Accession *
1949	Rome	Agreement for the establishment of the General Fisheries Council for the Mediterranean	
1968	Algiers	African Convention on the conservation of nature and natural resources	1977
1969	Brussels	Convention on the intervention on high seas in cases of oil-pollution casualties.	1976 (R)
1971	Ramsar	Convention. Convention on Wetlands of International Importance especially as Waterfowl Habitat	1981
1972	Paris	Convention for the Protection of the World Cultural and Natural Heritage	1975
1972	Washington	Convention on the Prohibition of the Development, Production, Stockpiling and use of Chemical Weapons	
1972	London	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	1976
1973	London	The International Convention for the Prevention of Pollution from Ships (MARPOL)	
1973	Washington	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	1975
1976	Barcelona	Convention. Protection of the Mediterranean Sea Against Pollution.	1977 (R)
1976	Barcelona	Protocole. For the Prevention of Pollution by Dumping from Ships and Aircraft or incineration at sea	1977 (R)
1976	Barcelona	Protocol concerning Cooperation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency	1977 (R)
1977	Cairo	Protocol between North African States to combat desertification	1979
1978	London	Protocol on prevention of pollution from ships (PROT MARPOL)	1983
1979	Bonn	Convention on the Conservation of Migratory Species of Wild Animals	1986
1979	Bern	Convention on conservation of European wildlife and natural habitats	1995
1979	Geneva	Convention on long-range transboundary air pollution.	
1980	Athens	Protocole. For the Protection of the Mediterranean Sea against Pollution from Land Based sources	1983 (R)
1982	Geneva	Protocol concerning Specially Protected Areas	1983 (R)
1982	Montego Bay	UN Convention on the Law of the Sea	1985
1985	Vienna	UN Convention for the Protection of the Ozone Layer	1989 (R)
1987	Montreal	Protocole. Substances that Deplete the Ozone Layer	1993 (R)
1989	Basel	Convention. Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1995 (R)
1990	London	Convention. International Convention on Oil Pollution Preparedness, Response and Co-Operation,	
1991	Bamako	African Convention. Hazardous Wastes	1992
1992	Helsinki	Convention. Protection and Use of Transboundary Watercourses and International Lakes	
1992	Helsinki	Convention. Transboundary Effects of Industrial Accidents	
1992	New York	UN Framework Convention on Climate Change	1993 (R)
1992	Rio	UN Convention.on Biodiversity	1993 (R)
1994	Paris	UN Convention to Combat. Desertification	1995 (R)
1994	Madrid	Protocol. Against Pollution Resulting from Exploration and Exploitation of the Continental Shelf, the Seabed and its Subsoil	(R)
1995	Barcelona	Amendments to the Barcelona Convention , 1976	(R)
1995	Barcelona	Amendements to the 1976 Dumping at Sea Protocol	(R)
1995	Barcelona	New Protocol. Specially Protected Areas and Biodiversity	(R)
1996	Syracuse	Amendments to the 1980 Protocol for the Protection of the Mediterranean Sea against Pollution from Land Based sources	(R)
1996	Monaco	Annexes to New Protocol for Specially Protection Areas SPA	(R)
1996	Izmir	Protocol. Transboundary Movements of Hazardous Wastes and Their Disposal	(R)
1997	Kyoto	Protocol to the UN Framework Convention on Climate Change on the Reduction of Greenhouse Gas Emissions	

* S = Signature ; A = Accession ; R = Ratification

5. Cross-sectorial policies and actions

PLANNING AND LAND-USE PLANNING

Land use planning must be analysed with its various physical, economic and social components through an understanding of the concept of territory¹³. The related diagnosis undertaken by planners shows that the relationship society has with its environment tends to be degrading. Indeed, the pressure exerted by a population which has quintupled and an economic activity which has increased tenfold within a century has resulted in the degradation of natural resources and unbalanced spatial management.

The question is how the Tunisian territory, marked by the precariousness of its natural habitat, the scarcity of resources and the harshness of its climate, can find an equilibrium towards the year 2015, date when its population will stabilise to reach between 12 to 15 million people.

The response to this question implies a detailed diagnosis of the state of the physical, social and economic environment, of the spatial management and of the various adopted strategies for economic and social development.

Territorial Appraisal

In thirty years (1961-1992) Tunisia has registered an appreciable GDP growth (an annual average of 5.5 %), well above the growth rate of the world economy (3.8 % p.a.).

However this performance should not conceal the damage to the environment (cf. chapters 2 and 3), especially:

- Degradation of soils and vegetation cover as well as overexploitation of aquifers in the steppe zones;
- Soil degradation and development deficiencies in the Northwest;
- Imbalances between water resources and needs in the coastal Sahel and in southern Tunisia;
- Spatial crowding and excessive intensification in certain parts of the eastern coast;
- Demo-economic imbalance and lack of tourism integration on the northern coast;
- The waste of space and incoherent urban development in the Tunis area, the Sahel of Sousse, as well as urban asphyxia already reached in Sfax.

National strategy and main guiding principles

According to the assessment-appraisal of the National Land Use Plan, a strategy stems out based on the development of modern zones (Tell - North East - Sahel) and on safeguarding fragile areas. For the south, the two approaches will be combined.

Based mainly on the potential of the natural habitat, the strategy aims to avoid the emergence of pressures on sensitive and arid habitats, which would involve withdrawals exceeding their capacity.

An offensive growth strategy needs to be adopted in the underexploited Tell, in the Sahel by better mastering its growth, and around the capital, to make Tunis a true metropolis. These major centres would absorb numerous workers who were exerting a pressure in sensitive areas, and originating the degradation of the natural environment. The strategy therefore aims at the necessary spatial differentiation.

¹³ Territory : " land area which a human society has modelled to respond to its vital needs for protection, production, for internal and external relations and above all for integration."

Resolution of the overpopulation problem. If a region is considered overpopulated, this does not mean that it has a high gross density of population but rather that the pressure exerted by the population exceeds the economic or ecological capacity of the place. In Tunisia, overpopulation takes place in arid milieux where scarce resources are overexploited by a high number of people. Neither the Tunis region, nor the east coast are overpopulated despite the concentration there; it is rather the low and high steppes of Central Tunisia and the Southern Steppe which have a very sensitive and overexploited milieu (overgrazing, overuse of aquifers) and lack other economic activities to absorb unemployment.

This overpopulation situation results largely from policies followed over several decades, which have sought to retain populations in hinterland regions through costly and not always profitable projects.

The new orientation consists in accelerating and curbing the growth of major regional centres, which will have an economic capacity able to absorb part of the rural population, and thus relieve the pressure on the natural environment. This type of efficient development could face up to international competitiveness through developing urban centres connected to the international market, industry with the promotion of new leading sectors (electronics, information technology, light chemicals, etc.), the services sector; strengthening the transport sector, and controlling real estate around these cities.

The mastery of sustainable development implies unavoidably the rational management of natural resources to ensure their perpetuity in both quantitative and qualitative terms. In urban areas this requires the mastery of densification whilst containing pollution and saving water and energy. In fragile habitats, the drop in demographic pressure would save forests, pasturelands and irrigated perimeters, notably the oases.

Economic efficiency and social equity. It is not possible to conceive similar levels of economic development between regions. National unity consists not in making equal the growth rate in the different areas but in ensuring their complementarity. Each region has its potential and vocation. It is only at the socio-cultural level that State action should be equal. Regions must benefit equitably from health services, education, training and all social services.

The Plan-programme and the National Land Use Scheme

Since the start of the 1960s, Tunisia has programmed its economic and social development by five-year plans drawn up by the Ministry of Economic Development, after broad consultation.

Land use cannot become a reality except by its integration in this planning process. The plan-programme is the key tool for the national land-use scheme (Schéma national d'Aménagement du territoire - SNAT).

SNAT translates development orientations on the territory and offers a spatial and prospective dimension to the country's development. SNAT is thus one of the key tools for sustainable development since it links development action with its sustainability dimensions, to spatial reality and to the geographical site concerned. The objective is to facilitate the implementation of the National Agenda 21 provisions.

SNAT was approved by the Higher Council for Land Use Planning in 1998, and presents a territorial diagnosis based on demographic trends, economic activity, coastalisation, polarisation of the capital, and the paradox between growth and natural milieux. Priority orientations are:

- a necessary urban real estate reservation for metropolitan development;
- upgrading rail transport within and between urban centres, a very efficient mode with low energy consumption for citizens' mobility and goods transport;
- the policy of protecting sensitive sites such as forests, steppes, beaches, sebkhas, islands...;
- infrastructure and major urban facilities.

It establishes a monitoring instrument panel for the SNAT and the plan-programme for the implementation and respect of the SNAT orientations by operators.

ENVIRONMENTAL LEGISLATION AND REGULATIONS

The protection of the environment and more especially that of natural resources have always been a major concern of the authorities and well before independence (1956). The first texts on soil restoration date from 1949 followed by the issue of two laws in 1958 on contour ploughing and obligatory reforestation. This first awareness about soil protection was confirmed by the promulgation of two codes, one on forests (1966) and the second on water (1975).

Texts relating to combating pollutions and those instituting a global framework for environmental protection were lacking during this period. Texts on natural resources have developed in fact due to the concern of the Ministry of Agriculture, responsible for their management. Pollution-related texts were slow in coming since there was no environmental structure during this period. The institutional and legal vacuum lasted until the establishment of the ANPE (1988). Its creation, followed by that of the MEAT, was at the origin of the development of a legal framework for environmental protection.

In general, the approach adopted has not been global, and the legal vacuum was filled every time the need was felt. Thus the arsenal of legal texts addressing very different domains is characterised by a certain fragmentation, with effects on the coherence of this legislation.

Despite these shortcomings, the legislative texts in force on the environmental field proved their efficiency when applied in the daily management of environmental protection matters.

Main legal texts on environment

Protection of natural resources

The **Forest Code** issued in 1966 and revised in 1988 ensures protection of wooded areas and institutes a forest regime by preserving restrictions on the use of wooded areas and pasturelands not owned by the State. This code sets out a regime for hunting, the creation and management of parks and natural reserves, and contains provisions for wetlands and wildlife protection.

Despite a forest police force, there are difficulties in implementing the code in a highly populated forest. The social provisions for the creation of Collective Interest Forestry Associations (AFIC) aiming to reconcile the forest with its inhabitants, i.e. the protection of forest resources, and to ensure at the same time income sources to inhabitants, do not seem to achieve results easily.

Repressive actions remain dominant in relation to preventive actions for the protection of forest resources. The preventive methods integrating social and economic aspects need to be developed.

The **Water Code** (1975) represents the most important text. It provides for measures for the prevention of surface and underground water pollution and partially deals with marine water. It sets out general provisions on wastewater treatment and individual sanitation. It is complemented by the 1985 decree, which deals with the general conditions for discharges into recipient areas.

Despite the creation of safeguard areas to limit the overexploitation of aquifers, salinisation continues to increase due to the intrusion of seawater. The code in itself is insufficient to preserve water resources; preventive actions such as wastewater treatment to limit pollution, artificial recharging of aquifers to lessen overexploitation, etc., need to be developed. These preventive actions should facilitate the application of a repressive character code.

There are numerous texts about **fishery resources**:

- the law relating to fishing activities, its organisation as well as the protection of aquatic species;
- the regulations of the Ministry of Agriculture about cockle's, underwater fishing, in dams and watercourses ...
- the regulation delimiting fishing zones with special provisions on their exploitation, which protects species in the process of extinction.

Soil conservation has been the major concern both of the authorities and of farmers. The legislative texts have succeeded each other without rigorous enforcement: defence and restoration of soils (1949 and 1958), protection of farmlands (1983), as well as the most recent ones:

- The code for soil and water conservation (1995), which establishes an intervention approach to protect soils, based on the partnership between the administration and beneficiaries of works;
- The code on land use and town planning (1979, revised in 1994) which provides for planning and rational management of urban and peri-urban areas.

Soils have suffered greatly from inappropriate exploitation methods and from a land use not suited to their characteristics. Entire towns have been built on flood-prone or fertile land.

Combating pollution

Texts relating to curbing pollution are numerous and varied. They mainly concern waste management, classified units the control and supervision of which are governed by the Labour Code, pesticides governed by legislation to protect vegetation, noise and other disturbances to public health governed by the organic law on municipalities.

In order to ensure a rigorous monitoring of milieux and pollution sources, a corps of inspectors was set up and its statute approved in 1990. This measure using a repressive power is translated by sanctions against polluters; it has been strengthened by a preventive measure (1991) consisting in the obligation to precede all projects by Environmental Impact Assessments to take into account environmental concerns in decision-making.

Legislative texts of a preventive character have been multiplied, such as the law about the use and maintenance of industrial zones (1994), the revision of the Town Planning Code of 1979, to become the Code on Land Use and Town Planning (1994), the law about the Public Maritime Domain (1995), the law establishing the National Emergency Intervention Plan to combat marine pollution incidents (1995), etc. These texts take all precautions so that developments take the environmental dimension into account and institute structures for the efficient combating of all forms of pollution.

As regards waste (household and industrial, dangerous and inert), the law on their management and disposal (1996) fills a legal vacuum, which characterised the preventive aspect in environmental protection. Implementing decrees are underway. The first to appear was that on packaging bags and used packaging.

Implementation of international agreements

Over fifty conventions and treaties have been ratified by Tunisia. The most recent are the amendments to the **Barcelona convention** and its protocols, which introduced the sustainable development dimension into concerns to protect the Mediterranean against pollution.

The implementation of this convention is carried out within a concerted framework between countries of the region, through the Mediterranean Action Plan in effect since 1975 and renewed following the Med 21 conference (Tunis, 1994). One of the MAP Activity Centres, the Centre for Specially Protected Areas and biodiversity (RAC/SPA) is based in Tunis.

The convention on **combating desertification**, which entered into force in 1997, is followed with great interest in Tunisia, where desertification is a major concern.

Tunisia is since involved and is one of the case-study countries for testing the content of eventual undertakings to implement the Convention, before their validation by a negotiating process. It is one of the first countries to have drawn up a National Action Programme and established a National Fund to Combat Desertification, which are necessary tools to implement the Convention.

The Tunisian National Action Plan, drawn up within the framework of a participatory process, is a federative programme, which integrates curative and preventive actions for combating the various types of desertification, to agricultural and rural development actions of the country, with its economic and social components.

A national committee and regional committees for combating desertification have been set up as subsidiary organs of the National Commission on Sustainable Development to monitor and promote the implementation of the action programme at all levels.

The implementation of the **Convention on Biodiversity** has enabled the country to carry out an inventory of continental and marine biodiversity.

The results of the inventory have been translated into a national strategy accompanied by a short and medium term action plan for the sustainable development and safeguard of active elements of biodiversity. This strategy gives priority to *in situ* conservation efforts (parks, reserves) as well as *ex situ* (botanical garden, living flora collections, and tree groves...) without relegating to second place sustainable development activities relating to genetic resources (seeds and landraces) and the constitution of a gene bank. Progress in the latter domain will permit Tunisia to limit dependence vis-à-vis laboratories for genetic improvement of species used in national production of basic elements for human and livestock nutrition.

Biodiversity matters and the preservation of local biological resources against eventual impacts of introducing genetically modified organisms, are also on the agenda, and a specific programme is being designed at present.

The **Convention on Climate Change** (UNFCCC) also benefits from close attention in Tunisia in relation to energy requirements.

Most of Tunisia's energy needs are met by fossil fuels (oil and gas) despite efforts over the last ten years to promote the use of renewable energies (solar and wind). Energy conservation programmes introduced by the Energy Management Agency which some time ago became the National Renewable Energies Agency (ANER), have been strengthened through actions undertaken within the framework of the UNFCCC implementation.

Within this framework, a study to inventory greenhouse gas emissions has just been completed which provides with elements of a medium-term action plan for energy efficiency, with measures to respond to global warming harmful effects, and measures to be taken for a more permanent monitoring of climatic and meteorological conditions.

Significant funds have been allocated to the implementation of the UNFCCC, relating mainly to the energy sector, to forest and rural reforestation, and to the promotion of urban green spaces for multiplying greenhouse gas 'sinks' and improving soil albedo.

Equally important efforts have also been made to implement the Montreal Protocol on the ozone layer by helping industries using CFCs to substitute them by other substances not harmful to the ozone layer.

Mechanisms and actions are being developed to implement **the conventions of Bale and Bamako on hazardous wastes**; a modern treatment unit for special and hazardous wastes is under construction. An intervention plan in case of accidental pollution at sea and on land is also operational through "task forces" and equipment, so as to allow the country on the one hand to cope with possible incidents taking place within its national jurisdiction, and on the other to participate with other countries in regional emergency assistance operations. In this way, Tunisia applies the provisions of the Barcelona and London conventions on responses to marine pollution incidents.

THE NATIONAL COMMISSION FOR SUSTAINABLE DEVELOPMENT (CNDD)

The National Commission for Sustainable Development (Commission Nationale pour le Développement Durable) was established under a President initiative in October 1993, a year after the creation of the MEAT, for "elaborating and implementing a national strategy and action plan for sustainable development".

Like the UN Commission on Sustainable Development, CNDD is above all a co-ordinating body between various national development actors.

Chaired by the Prime Minister, the CNDD includes the majority of government members, representatives of the chamber of deputies, socio-professional organisations, women's and youth organisations, and NGOs. The Minister of the Environment is vice-president and is responsible for the permanent secretariat.

The CNDD has already adopted the National Agenda 21, priority actions for sustainable development for the 9^h Plan for Economic and Social Development, national action programmes to combat desertification and manage biodiversity.

CNDD is envisaged as a forum for advice and proposal of decisions to bring Tunisia's development towards pathways and objectives of sustainability, with the involvement of all parties concerned by the development process.

The central structure of the CNDD will be decentralised in order to establish regional as well as local commissions for sustainable development, which will tend to take the place of the regional and local development councils.

CNDD deliberations

First meeting, May 1994. It was devoted to the establishment of its subsidiary bodies and operating rules.

Apart from the technical committee and the permanent secretariat chaired by the Minister of the Environment and Land Use Planning, eight sectorial committees were established, charged with reflection and making proposals about the sustainable development dimensions of each development sector.

These technical committees, each one overseen by the Minister in charge of the sector under consideration and bringing together representatives of various departments concerned as well as civil society, propose recommendations for action to each sector. These recommendations are examined at the level of the Committee chaired by the Minister for the Environment and Land Use, who finalises them with the permanent secretariat before proposing them for examination and adoption by the CNDD.

Second meeting, July 1995. CNDD examined and adopted the national Agenda 21 emerging from an iterative and consultative process, which had started in 1993 immediately after the Rio conference.

Third meeting, July 1996. Adoption of the priority action programme for sustainable development for the period of the 9th Plan for Economic and Social Development (1997-2001).

Fourth meeting, October 1997. CNDD adopted environmental indicators and recommended their use for the monitoring and continuous surveillance of the state of the environment by the various operators.

Fifth meeting, June 1998. CNDD adopted important programmes for strategic action: the national programme of action to combat desertification and the national strategy for the sustainable biodiversity management. These two national programmes constitute tools for the implementation of the two corresponding international conventions. Two subsidiary organs were established: the National Commission to Combat Desertification and one on biosecurity and biodiversity, to support the technical committee on sustainable development in the follow up of actions relating to the implementation of the two corresponding programmes of action.

Sixth meeting, November 1999. CNDD adopted the indicators proposed and gave its approval for their completion by those published within the programme of the UN CSD. Other important guidelines were adopted: i.e. the consideration of the concept of sustainable development in the preparation of the 10th Plan; inclusion of the regional dimension in the action plan to combat desertification; generation of employment in environmental protection activities.

Seventh meeting, July 2000. The CNDD examined the state of advancement of the implementation of the process of sustainable development by various partners; it recommended the restructuring of its bodies by the replacement of the eight sectorial committees by four intersectorial committees in charge of establishing practical guides for each theme: the environment and economic and social development; protection of natural resources and biodiversity; major anti-pollution actions; quality of life in urban areas.

NATIONAL ACTION PROGRAMME FOR ENVIRONMENT AND DEVELOPMENT

The challenges of a development respectful of the environment

The 1992 UN Conference on Environment and Development (UNCED) in Rio culminated in the adoption of Agenda 21, a planetary action plan proposed by the international community as the basis for a new global partnership at the service of sustainable development and protection of the environment. UNCED however recommended to each country to draw up its own Agenda 21, adapted to its resources, population, state of its environment, level of development and priorities so as to establish a pathway for harmonious development respectful of the environment.

The main stakes of this ambitious programme concern:

- The rehabilitation and revitalisation of sustainable growth since the main environmental problems arise from an unsuitable development process. Development should not take place to the detriment of the environment; it must be in harmony with it.
- The guarantee of decent living conditions for the present population and for future generations.
- The emergence of a healthy environment by development of infrastructure and control of all types of pollution.
- The sustainable management of natural resources to guarantee their continuity and renewal, taking into account the various threats to which they are exposed.
- The preservation of the common heritage of humanity: atmosphere, sea and oceans, global climate.

These shared riches demand sustained international co-operation to protect them effectively.

After adoption of the Mediterranean Agenda 21 at the Tunis conference in November 1994, Tunisia finished preparation during 1995 of its own Agenda 21 "the national action programme for the environment and sustainable development for the XXIst century".

The challenge of the Tunisian Agenda 21 is to generalise actions to protect the environment and preserve natural resources, to consolidate achievements to date, and to maintain the rhythm of growth of economic and social actions.

This national programme of action for the environment and sustainable development constitutes a valuable conceptual guide for decision-makers. It serves to orient the various economic and social development plans.

The contents of the Tunisian Agenda 21

For Tunisia, sustainable development is both an objective and an orientation for economic and social development arising from the will to reconcile obligations of economic growth and the improvement of the population's social conditions on the one hand, with the requirements of natural resource conservation and environmental protection on the other. The programme has been established in respect of the principles of equity and social ethics and of the human being.

Sustainable development equally requires the use of economic instruments suitable to the requirements of sustainability, and eco-environmental accounting integrated into a monitoring system based on indicators to evaluate results. Extracts from the Tunisian Agenda 21 are reproduced below.

Sustainable development, equity and poverty alleviation

Sustainable development aims at the improvement of present and future social and human welfare under the strict constraint of the preservation of the global natural capital stock (air, water, natural resources), physical capital (the product of human labour, equipment, technology) and human capital (aptitude, capacities, abilities of individuals).

The Tunisian Agenda 21 gives a high importance to human development and to ensuring nutrition, health, education and training. The qualitative and quantitative preservation of human resources and the strengthening of their capacity for development are broadly safeguarded by various social policies and will continue to receive the necessary support in future plans. Natural capital should receive absolute priority for its conservation since there exists an interrelation between poverty and environmental degradation.

The principle of social ethics considers that future generations have the right to inherit (in terms of global capital, including natural capital) a sufficient capital to enable them to have the same possibilities to generate a level of well-being at least equivalent to that enjoyed by the present generation.

The struggle against poverty is considered as a major objective for sustainable development. This is a human development strategy comprising:

- curbing demographic growth,
- improving the basic health system (maternal and infant),
- education and promotion of women,
- regional development.

The actions to be taken are directed more towards support for poor people's access to employment and the sustainable exploitation of natural resources by progressively eliminating direct assistance to families. The organisation of the population and its participation in all phases of development projects is an obligatory pathway to sustainable development.

Modification of consumption patterns and sustainable development

The main cause of the continuous degradation of the environment is a "non viable" consumption and production pattern arising out of the unequal distribution of wealth. It signifies the overexploitation of resources and their inefficient use, involving waste. On the one hand, the rich sectors consume well in excess of their vital needs, on the other poor groups overexploit natural resources to meet theirs.

Therefore, there must be an orientation towards a production pattern that protects the environment, which will in turn condition the consumption pattern. For example, the substitution of animal by vegetable proteins automatically involves less pressure on degraded steppes and forest pasturelands.

Actions to be undertaken must respond to:

- reduction and elimination of malnutrition and nutritional deficiencies;
- modification of food consumption patterns which in turn impose the production pattern;
- adaptation of a production pattern that protects the environment.

Demographic dynamics and sustainability

Actions must take into consideration the economic effects of population growth and concentration, of consumption intensity per head and of the effect of technology on the entire natural heritage. The integration of the environmental component is in every demographic policy.

The principle to be respected consists in maintaining certain equilibrium between population, consumption and appropriate technology to preserve the environment against every type of degradation and to ensure the natural resources sustainability. This principle, peculiar to sustainable development, is respected across all development sectors (agriculture, industry...).

Protection and promotion of health for sustainable development

The improvement of people's living conditions demands the satisfaction of needs for health care and medical attention. The national programme's main lines are:

- Combating contagious diseases and transmission vectors (pollution reduction, waste collection and removal);
- Treatment of common illnesses;
- Maternal and child health;
- Development of hygiene and protection of the environment at citizens' level;
- Implementation of vaccination programmes, of anti-diarrhoea actions, of reduction of respiratory diseases, AIDS and tuberculosis;
- Implementation of programmes to prevent water-borne diseases, linked to food hygiene and air quality.

All these programmes are based on information, education and communication. The strengthening of human, financial and material resources in institutions in charge of following up these actions, the development of an observatory of diseases transmission vectors, and the development of international co-operation, contribute to human development, the primary component of sustainable development.

OTHER TOOLS FOR SUSTAINABLE DEVELOPMENT

For implementing this policy, several tools have been developed to give substance to means of engagement in the sustainable development pathway, which until then had remained on the more or less conceptual and theoretical level. Besides the CNDD in 1993, the national Agenda 21 in 1995, the national land use scheme in 1998, other main implementing instruments are the regional and local Agendas 21, economic instruments as well as monitoring and evaluation tools.

Local and regional Agendas

The adequate implementation of the National Agenda 21 requires a greater degree of decentralisation in economic and social development as well as the build-up of regional and local structures, to permit their increased involvement in the conception, implementation and monitoring of development projects.

A process to establish regional (at the governorate level) as well as local urban and rural Agendas 21 (at the municipal and delegation level) started in 1997, with the aim of ending towards the end of 2001 each region, each urban commune and rural delegation, with a planning and programming document for global and integrated development for the next 50 years.

Cities like Sousse and Djerba have already sketched out their respective Agendas 21, which set out the genuine concerns of development actors and the environmental protection priorities integrated into those of the economic and social development of the city.

Economic instruments for environment and development

The new provisions of the Investment Incentives Code (Code d'Incitations aux Investissements - CII) as well as the implementing texts, the latest issued in 1994, set out the eligibility rules and the procedure for benefiting from incentive measures, which are targeted according to priorities for curbing pollution, eliminating polluting discharges, and for waste management, upgrading and disposal.

In accordance with the new legislative and regulatory text, investments in projects contributing to environmental protection can benefit from:

- The incentive regime common to all investments;
- The incentive regime specific to investments made by enterprises for the elimination of their own polluting discharges or by enterprises specialised in waste collection, recycling and upgrading (exemption for customs duties and taxes, subsidies).

Moreover, FODEP, which encourages actions contributing to environmental protection against industrial pollution, has enabled the financing of industrial facilities aimed at reducing or eliminating pollution, and of projects for waste collection and recycling plants.

Monitoring and evaluation tools

Since 1993, MEAT has annually published a national Report on the State of the Environment, drawn up with the contribution of thematic experts for carrying out the analyses.

The monitoring and evaluation of the state of the environment is undertaken by OTEDD, set up within the ANPE in 1995, whose activities are mainly concentrated on the development of environmental and sustainable development indicators.

In the future, the reports on the state of the environment will be prepared on the basis of an increased use of the quantitative indicators developed by OTEDD, which will make it easier to identify long-term trends and anticipate future changes.

Acronyms and Abbreviations

ACES	Association pour la conservation des eaux et des sols / Association for Soil and Water Conservation
AFIC	Association Forestière d'Intérêt Collectif / Collective Interest Forestry Association
AIC	Association d'intérêt collectif / Collective Interest Association
AMU	Arab Maghreb Union
ANER	Agence Nationale des Energies Renouvelables / National Renewable Energies Agency
ANPE	Agence Nationale de Protection de l'Environnement / National Environmental Protection Agency
APAL	Agence de Protection et d'Aménagement du Littoral / Agency for Coastal Protection and Planning
BOD	Biological Oxygen Demand
CGDR	Commissariat Général de Développement Régional / General Commissariat for Regional Development
CIAT	Comité Interministériel pour l'Aménagement du Territoire / Interministerial Committee for Land Use Planning
CII	Code d'Incitations aux Investissements / Code for stimulating investments
CITET	Centre International des Technologies de l'Environnement: International / Centre for Environmental Technologies
CNDD	Commission Nationale du Développement Durable / National Commission for Sustainable Development
CNE	Commission Nationale de l'Environnement / National Environment Commission
CRDA	Commissariat Régional de Développement Agricole / Regional Commissariat for Agricultural Development
CSA	Coopératives de services agricoles / Agricultural Services Co-operatives
DCNMR	Direction de la Conservation de la Nature et du Milieu Rural / Directorate for the Conservation of Nature and Rural Areas
DGEGTH	Direction Générale des Etudes et Grands Travaux Hydrauliques / General Directorate for Studies and Major Hydraulic Works
DGF	Direction Générale des Forêts / General Directorate for Forestry
DGRE	Direction Générale des Ressources en eau / General Directorate for Water Resources
DPM	Domaine Public Maritime / Public Maritime Domain
EIA	Environmental Impact Assessment
EIB	European Investment Bank
FODEP	Fonds de Dépollution / Anti-Pollution Fund
FSN	Fonds de Solidarité Nationale / National Solidarity Fund
GEF	Global Environment Facility
GTZ	German technical Co-operation agency
INAT	Institut National Agronomique de Tunis / National Agronomic Institute of Tunis
INRAT	Institut National de la Recherche Agronomique de Tunis / National Institute for Agronomic Research, Tunis
INRGREF	Institut National de Recherches du Génie Rural, des Eaux et des Forêts / National Research Institute for Rural Engineering, Water and Forests
INRST	Institut National de la Recherche Scientifique et Technique / National Institute for Scientific and Technical Research
INSTM	Institut National des Sciences et Techniques de la Mer / National Institute for Marine Science and Techniques
IRA	Institut des Régions Arides / Institute for Arid Regions

ISTP	Institut Sylvo-Pastoral de Tabarka / Sylvo-Pastoral Institute at Tabarka
MAP	Mediterranean Action Plan
MEAT	Ministère de l'Environnement et de l'Aménagement du Territoire / Ministry for the Environment and Land Use Planning
METAP	Mediterranean Environment Technical Assistance Programme
ONAS	Office National d'Assainissement / National Sanitation Office
NGO	Non-governmental organisation
OTEDD	Observatoire Tunisien de l'Environnement et du Développement Durable / Tunisian Observatory for Environment and Sustainable Development
PANLCD	Plan d'action national de lutte contre la désertification / National action plan to combat desertification
PDRI	Programmes de Développement Rural Intégré / Integrated Rural Development Programmes
RAC/SPA	Regional Activity Centre for Specially Protected Areas
SNAT	Schéma National d'Aménagement du Territoire National / National Land Use Scheme
SONEDE	Société Nationale de Distribution des Eaux National / Company for Water Management and Distribution
SWC	Soil and Water Conservation
TD	Tunisian Dinar
USAID	United States Agency for International Development
UNCED	United Nations Conference on Environment and Development
UNCSD	UN Commission for Sustainable Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compounds