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## IMPLICATIONS OF CLIMATIC CHANGES ON THE SOCIO-ECONOMIC ACTIVITIES IN THE MEDITERRANEAN COASTAL ZONE

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## 1. INTRODUCTION

The socio-economic structure and activities of any individual country or region are closely dependant upon the existing climatic conditions. This is so because the climatic conditions impact both the natural environment (the soil, water, sea, air, vegetation, and the forests - they represent the basis of all human activities and conditions of life on Earth), and the way people live, their activities and the dynamics of a society in individual areas.

There exists a concensus in the scientific community over the prediction that even in the near future CO<sub>2</sub> and other gases will bring about a rise in temperatures which will progressively cause a change in other climatic conditions as well as the natural environment, which in itself has more or less been a stable basis of the socio-economic structure and activity for the last few millenia. Therefore, an answer to the question of how the expected climatic changes will affect the further development of human society and its capability to adapt to such changes or its capability to properly react to problems that the change in the environment will bring about, must quickly be found.

In assessing the impact of climatic changes on the socio-economic structure and activities, a number of problems and difficulties arise. Many of these have been fixed by William C. Clark in his thesis "On the practical implications of the Greenhouse question" submitted at the International Conference in Villach 1985. However, these changes are more concrete with respect to their impact on the socio-economic structure and up to now less researched than the causes already at work and the consequences that could come about in the natural systems.

Supposing that the appearance and accumulation of the greenhouse gasses will simultaneously be manifested both on a general area and locally, we may assume that their impact on the socio-economic structure will primarily be local with possibly important common characteristics for both small and large areas or regions such as the Mediterranean area. Naturally, the progressive accumulation of climatic changes will also affect the general socio-economic structure of the world as a whole and as a sum of all local impacts. However, the assessment of both local and regional impacts presents great difficulties due to inadequate understanding and knowledge of the local situations. The varying size and power of the local and regional socio-economic structures also present a problem in assessment.

Referring to the terms of reference for the report of the "Task team on implications of climatic changes in the Mediterranean" at the meeting in Geneva on May 13-14th, 1987 and at the meeting in Harlem on October 21-22nd, 1987, we can find the basic conditions for all studies on specific subjects within the limits of the general report of the task team. The report and the analyses of specific subjects should be based on:

- (a) the best available existing knowledge about and insight into the problems relevant to the subject of the study;

- (b) assumptions accepted at the International Conference in Villach, October 9th to 15th, 1985, i.e. increased temperature of 1.5-4.5°C and a sea level rise of 20-140 cm before the end of the 21st century (for the purpose of this study a temperature elevation of 1.5°C and a sea level rise of 20 cm by the year 2025 was accepted with the understanding that these estimates may have to be revised on the basis of new scientific evidence).

Under the general objectives of the study on the implications of expected climatic changes for the marine and coastal environment in the Mediterranean found in the minutes from Geneva 1987 on page 1 (form a-d) one can section out c) - (objectives; to examine the possible impacts of climatic, physiographic and ecological changes on the socio-economic structure and activities). Likewise, under specific subjects to be analyzed on the Mediterranean scale on page 2 item 12, one can section out h) - (impact on coastal activities, such as tourism, industry, settlements, etc.) and i) - (distribution and dynamics of population in littoral zones).

According to the minutes of the meeting in Geneva (May of 1987) and confirmed by the minutes of the meeting in Harlem (October of 1987), the coordination of these studies was assigned to the Blue Plan (BP/RAC) and to the Priority Actions Program (PAP/RAC). However, this was only partly or not at all carried out, because in 1987 the work schedule of those activities within MAP was already defined or close to being defined. Only afterwards did PAP make its assessment of the climatic changes for the specific activities existing on its agenda. Likewise, the Blue Plan is making an effort to incorporate some elements of the impacts of climatic changes on both the socio-economic structure and activity into the final edition of its report, which is being revised right now. The preliminary reports of the Blue Plan were completed in June of 1987. For these reasons the authors of this report examined and used only the data and materials of the Priority Actions Program and of the Blue Plan which dealt with the possible impacts of the climatic changes. To a greater extent they used facts from other sources and from a large number of consulted experts on local situations.

Besides the mentioned problems of knowing the local situations in which the socio-economic structures and activities will be impacted by climatic changes, there are other problems with specific and different aspects. They arise when determining the general characteristics of the greenhouse effect with respect to the structure and activities being analyzed.

The climatic changes which impact the environment and the consequent environmental changes are fairly well defined when it comes to the air temperature rise and the sea level rise. However, the changes in other climatic conditions also impacted (e.g. vegetation, soil, water, evapo-transportation, etc.) are not so well defined.

Reducing both the impacts of climatic changes and the reactions of the socio-economic structure will in the next century mainly have financial repercussions. There will be new investments for reducing the impacts of the sea level rise as well as for insuring adequate amounts of water for agriculture or for the population of a given area.

The socio-economic structures will become dependant to a greater extent upon the impacts of climatic changes especially by the end of the next century. Expecting the climatic changes to represent a permanent occurrence will affect the investment policies needed for the reduction of these impacts.

The correlation between the greenhouse effect and the problems of energy, agriculture, urbanization and environment in general will require that new strategies be developed for the following: the directions of socio-economic development, new goals in technological development, a plan of environmental protection on the whole, and the protection from waste pollution.

It is a fact that the changes brought about by the greenhouse effect are of a slow nature, while the socio-political and economic structures are adapted to react only to impending emergencies and dangers. A very complex net of socio-economic structures needs, according to present experience, a period of 20 to 50 years to adapt without the realistic probability of predicting and calculating the consequences.

Increased investments and expenditures for the reduction of the negative impacts of climatic changes may bring the developing countries into an unfavorable and unequal position. This is significant for the southern and eastern Mediterranean countries.

The examination and analysis of the impacts of climatic changes on the socio-economic structures are very dependant upon a realistic assessment of the ways those changes impact the natural systems both regionally and locally. Taking into account the complexity and inertness of socio-economic structures in their dealing with new social processes brought about by the changes, it is difficult to give a firm appraisal of the ways in which a socio-economic structure could adapt its activities either to a newly arisen situation or to a process of continual change.

It is also very difficult to separate the analysis and definition of the impacts on the socio-economic structure from the analysis of the impacts of human activities on the development of the greenhouse effect. Nevertheless, the assessment of these impacts should be a stimulus for preliminary research on the local, regional and sectoral socio-economic levels (and that for scientific research) as well as a stimulus for developing tentative strategies to combat these impacts.

## 2. BACKGROUND INFORMATION

The Mediterranean area, defined by the Barcelona Convention as having common geographic, cultural and climatic characteristics, is nevertheless a set of geographically, economically, socially and politically different structures. They are on the one hand interconnected while on the other tied to other political, cultural and social unities, which themselves reach far inland but still very strongly affect the immediate coastal zones and the Mediterranean Sea.

There are 18 countries located on the coasts of the Mediterranean Sea, and their coastal areas are under direct impact by the sea (Figure 1). These coastal areas in turn directly impact the surrounding environment of the Mediterranean Sea.

It seems relatively simple to define the Mediterranean area in its entirety, but difficulties do arise when trying to fix the boundaries of the impact by the Mediterranean Sea on the coast and viceversa. Several zones may be defined taking into account the overall weight of the climatic, cultural, traffic, economic and political impact.

For the assessment of the impacts by the climatic factors, the following demarcations are the most important:

- 1) The coast line - an area where land and sea meet along with that part of the shore on which there are expected strong impacts of the sea level rise. That territory includes both the inhabited and the uninhabited municipal regions, the ports themselves, a good part of industry, plus roads and traffic ways erected near the shore. That area may vary in width from a few meters up to 500 or even 1000 meters with respect to land configuration. In certain cases this may even be more, but that is difficult to determine without detailed information and research.
- 2) The immediate coastal belt - an area which varies in width from 1 to 10 and frequently more kilometers; on which indirect consequences of the sea level rise will be felt; which will suffer from possible changes in the rainfall and thus in the supply of drinking water; and whose width depends upon the restructuring and changes which will come about along the coast line. Included in the coastal belt are parts of cities further from the coast line, a large part of the industry, harbours located further inland, agricultural areas, traffic ways and so on.
- 3) Mediterranean regions as defined by the Blue Plan - these are regions with strong Mediterranean characteristics and are located within individual administrative units; this allowed for the determination of the most important figures on the numbers of inhabitants and on the area. In any given country some administrative units reach farther inland than others, and in turn some comprise a greater percentage of the national territory than others. Those administrative units will carry out and play the greatest part in both the organizational and economic activities geared toward alleviating the impacts of climatic changes. Most of the river-system territories are also found in these regions.
- 4) The national territories of the Mediterranean countries - Due to the impact of the dynamic growth, migration, and urbanization of populations and of the total economic growth as well as the impact of coastal zone decision making centers on the country as a whole, it is often necessary to include the entire territories of individual countries when assessing the impacts of climatic changes.

Precise information on the environmental conditions, economic activities, plus infrastructures and superstructures for the above two areas does not exist. Any changes could be accepted only on the basis of knowledge about the technological characteristics of individual places and structures in which economic activities (harbours, refineries, industries) or everyday life (cities) is taking place. However, it is difficult to distinguish the elements under number 1) from those in number 2).

An assessment of the number of inhabitants immediately next to the coast line (as defined under number 1) or in the immediate coastal belt (as defined under number 2) may be made with reference to the percentages of people in the Mediterranean administrative regions (defined under number 3). But, this will only be a general guide value. Therefore, the number of people living next to the coast line (1) is estimated as 5% of the population of the coastal administrative regions. Likewise, the number of inhabitants of the immediate coastal belt (2) is estimated as 30 - 50% of the population of the coastal administrative regions (3).

This is however an appraisal of the Mediterranean area in its entirety. The states and conditions in individual countries greatly vary.

To evaluate the adaptability of the socio-economic structures and activities to the changes in climatic conditions, it is important to know the state of the economy in each individual Mediterranean country. The basic premise that the climatic changes will tax the national economy and especially the coastal economic structures of any individual country through their mitigation is non-debatable. Therefore, facts and figures on the distribution of the Gross Domestic Product (GDP) and of the Gross National Product (GNP) are most valuable (shown in Figures 2 & 3; Tables 1-3). For the appraisal of the future development and economic strenght of any individual country, we are also attaching facts concerning the GDP development assessments of all the Mediterranean countries for the periods 1985 to 2000 and 2000 to 2025 (Tables 4 & 5). With regard to the relatively low level of development in most of the Mediterranean countries, the expected rate of growth of these countries will be somewhat higher on the average than that of the more developed countries.

### 3. INTEGRATED PLANNING

#### 3.1. SCENARIOS OF THE POSSIBLE LONGTERM DEVELOPMENT OF THE MEDITERRANEAN FOR THE YEARS 2000 and 2025

Within the framework of the Mediterranean Action Plan (MAP) and its component called "Integrated Planning", an objective of the Blue Plan was to study and research the long term relationship between development and the Mediterranean environment.

After assessing both the past growth of those relationships and their existing state (first phase of the Blue Plan; shown in general in Background Information), the assessment of possible future relationships between development and the environment on the Mediterranean was made possible. This assessment was to be in the form of a scenario which is the method chosen

as the most adequate taking into account the accessibility of data, the times for which it is being written (the years 2000 and 2025), and the possibility of a logical and flexible interpretation. Collecting the data presented great difficulties for basically two reasons:

- a) In studies on the development of large global macromodels (Petzel-Mesarovic, Leontieff et al.) the Mediterranean is not defined as a macroregion. In each model it is found in several different global regions.
- b) Specific figures on the socio-economic structure in coastal zones are very hidden in the national statistics; at best they may be found on the statistical level of the Mediterranean administrative regions. Likewise, figures concerning the state of the natural environment are hidden in individual studies, surveys, assessments, etc.

Plainly, without precise data on the natural environment of smaller individual regions, it is difficult to study the impact of the socio-economic structure on the environment.

Because of this fact and the fact that the time range of Blue Plan's research extends only to the years 2000 and 2025, that is to years in which climatic changes will still not be dramatic, these very changes have been for the most part overlooked in the first draft of the Blue Plan report. In editing the final version of the Blue Plan report, efforts have been taken to assess and include the impacts of climatic changes on the socio-economic structures and activities. This especially concerns the study dealing with the coastal region, its development and its environmental management. However, this final research is still in progress so that the gathered materials could only partly be used in this study.

During the initial concept of the Blue Plan in 1978/1980, the need of a special scenario dealing with interruptions, standstills, ruptures, surprises, mutations and catastrophies was being examined. However, nobody at that time predicted the need for a scenario dealing with the impacts of climatic changes as they were defined at the Villach Conference in 1985.

The results achieved by the application of the methods in the Blue Plan scenario do not show us definite relationships between development and the environment. These results do not even point out or suggest any national "plans" geared toward development and protection of the environment nor "plans" for the entire Mediterranean in spite of the conditional name "Blue Plan" for the Mediterranean. They do however enlighten research into the "possible future" within the framework of what is realistically probable.

The scenarios are based upon a number of hypotheses in which the established and existing tendencies of the socio-economic development and especially "strong tendencies" are interpreted. In these hypotheses their consequences vary according to the principles of chain reactions: "if...then" connecting the present and the future.

The interpretation of the chosen hypotheses and the variation of the basic existing tendency and trend for the chosen time periods (the years 2000 and 2025) was carried out in the scenarios of the Blue Plan. This was done by comparing selected main environmental components with the main developmental activities so that the dynamics of the Mediterranean system could be determined and understood.

For the main environmental variables and components the following were chosen: the sea (both the coastal and the open), land and soil (land as the basis of production and soil as the composition), inland waters, forests, and the coast line.

For the main socio-economic activities the following were chosen: agriculture, fisheries, industry, energy, tourism and transport.

However, three basic parameters must be added to the 5 sectors chosen: population, urbanization, and coastal concentration.

The listed environmental components and socio-economic sectors are interconnected. Also, the possible hypotheses which make up the key characteristics of the scenario will be found within the parameters of the "dimensions" chosen for the scenarios. Namely:

- the international economic context
- the Mediterranean populations and their movements
- the national development strategies
- the management of different areas
- the consideration of the environment.

On the basis of both parameters thusly set and chosen and the hypotheses, Blue Plan approached the task and in turn worked out the 5 following scenarios:

three trend scenarios-

- 1) Reference trend scenario  $T_1$
- 2) Worse trend scenario  $T_2$
- 3) Moderate trend scenario  $T_3$

plus

two alternative scenarios-

- 1) Alternative reference scenario  $A_1$
- 2) Alternative integration scenario  $A_2$

Here the term "trend" refers less to present statistical trends and more to present political, strategic and climatic trends and tendencies suitable for cooperation even though these scenarios are to a great extent based upon tendencies presently in progress.

The presentation of the interpretations of the chosen hypotheses within the parameters of the set "dimensions" of the environmental and socio-economic components would take up to much space at this time.

Apart from the fact that Blue Plan did not specifically assess the impact of the climatic changes, it is true that the results of the scenarios in general do draw a picture of the possible changes in development and their influence on the environmental components. In the present edition of the final report of the Blue Plan, the general picture is best seen through the presentation of the scenario dealing with population migrations (movements) in the Mediterranean countries and their administrative coastal regions (Table 6).

Other important general guide-points are the facts and figures covering the economic growth, both the Gross Domestic Product and the Gross National Product.

As stated in the introduction, the impact of the climatic changes on the socio-economic structure and activities will first be felt as the rise of expenditures for the reduction of the negative effects of those changes. This is especially true in the case of keeping back the sea level rise. Also, it is very difficult or nearly impossible at this time to determine the size of the expenditures for the reduction of the effects that will come about in agriculture and especially in food production.

For those reasons, the following chart showing the "behavioral strategies" for the reduction of the effects of climatic changes has been made for four scenarios: (next page)

On a very generalized scheme, such as this one, showing the strategies for the reduction of the effects of climatic changes for the four scenarios, it is very difficult to elaborate any further. That is, further elaboration in the direction of either the sizes or the base orders of magnitude of new expenditures is not possible, because that is both regionally and locally conditioned.

However, according to the only experience so far in reducing the effects brought about by climatic changes that is specifically in reducing the dynamic sea level rise witnessed in Holland, we may conclude that the expenditures take up a relatively acceptable part (1-3%) of the Gross National Product (GNP).

If the action of reducing the climatic changes in terms of the sea level rise was a national strategic endeavor, then it should not be a great burden. But, if such action was left up to coastal regions and coastal authorities, the results might be individual and separate interventions which would not ensure complete protection. Difficulties such as these would probably not be present in the developed countries, but they might occur in the developing countries.

The need for expenditures geared toward the protection from the effects of climatic changes might bring about a reduction of the expenditures for environmental protection.

However, in forming internationally coordinated national actions for protection from the effects of climatic changes, a great psychological problem arises. This problem is the fact that changes are slow in their manifestation, and that structures which make political, administrative and economic decisions are generally oriented toward solving current problems (that is those which are already present or will arise in the near future).

|                                                    | Impact effects in the world                                                                                                                                                                                  | Conditions and reactions in the Mediterranean                                                | Assessment of actions and expenditures                                                                                                    |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| T <sub>2</sub><br>worse trend scenario             | Not great impacts of emission due to reduced activity; lower energy consumption                                                                                                                              | Insignificant reactions                                                                      | Sporadic reactions - one by one, everyone acts for himself, minimal effects of reducing the consequences - slowest and unsure preventions |
| T <sub>3</sub><br>moderate trend scenario          | Maximum emission, much activity, high energy consumption                                                                                                                                                     | Stronger but delayed reactions (economic growth more or less spontaneous - uncontrolled)     | Effects of maximal reaction, local, regional, or national. Expenditures very high due to uncoordinated and delayed reactions              |
| A <sub>1</sub><br>alternative trend scenario       | Approximately like T <sub>3</sub> , but start of fight for protection, start of research for less emissions, start of technology for reduction of effects (installing natural gas, greater solar energy use) | Strong cooperation North-South, substantial financial funds, tendencies for new technologies | Coordinated reaction for fight against consequences, also for on-time initiation of measures (prevention)                                 |
| A <sub>2</sub><br>alternative integration scenario | Approximately like A <sub>1</sub> , but with the use of solar energy and natural gas                                                                                                                         | Approximately like A <sub>1</sub> , weaker cooperation North-South, stronger South-South     | Approximately like A <sub>1</sub> , less coordinated, smaller funds                                                                       |

### 3.2. PRIORITY ACTIONS PROGRAM

The Priority Actions Program (PAP) is a part of the Integrated Planning of MAP. The task of PAP is to carry out practical actions which are expected to yield immediate results; whereas, its aim is to contribute through the exchange of available experience and cooperation among the Mediterranean countries to the protection and enhancement of the Mediterranean environment, to the strengthening of the local and national capacities which plan and manage the coastal zones, and to contribute to the alleviation of the existing socio-economic inequalities among the countries of the region.

The activity of PAP covers six priority fields selected and agreed upon by the Contracting Parties. Within these priority fields, PAP is carrying out ten priority actions.

- Water Resources Management on the Mediterranean Islands and in the Isolated Coastal Zones

The basic objective of this action is to contribute, on the basis of experience, to the better development and use of water resources in the Mediterranean coastal zones, particularly on the islands and in the coastal areas lacking water, while paying special attention to the protection of water resources against pollution and sea-water intrusion as well as to their management under the specific conditions created by the development of tourism.

- Integrated Planning and Management of the Mediterranean Coastal Zones

The objectives of the action are to: a) establish the exchange of experience and knowledge on the inter-relation between integrated planning and the protection and enhancement of the Mediterranean environment; b) cooperate with and assist the Mediterranean states in utilizing the existing knowledge in environmentally sound planning, managing and developing of the coastal zones, providing the necessary methodological basis, introducing applicable modern tools and techniques, and implementing projects of direct cooperation in selected coastal zones.

- Rehabilitation and Reconstruction of the Historic Mediterranean Settlements

The objectives of this action are to: a) provide demonstrational studies and the methodological basis for the actions on protection and rehabilitation of the historic Mediterranean settlements; b) contribute to the achievement of the target set up by the Genova Declaration related to the identification and protection of 100 historic sites of common Mediterranean interest; and c) cooperate with and assist the Mediterranean countries in the practice of protection and rehabilitation of historic settlements.

- Land-use Planning in Earthquake Zones

The objectives of this action are to: a) cooperate with and assist the countries in activities related to mitigation of the seismic risk; and b) promote and support the cooperative project of the mitigation of seismic risk in the Mediterranean earthquake zones.

- Solid and Liquid Waste Collection, Disposal and Management

The objectives of this activity are to: a) take actions aimed at improving the solid and liquid waste management in the Mediterranean countries; b) alleviate the undesirable effects of discharged waste water in the coastal sea areas; c) contribute to the upgrading of sanitary conditions in rural and urban areas of the Mediterranean basin through the improvement of planning, maintenance and operation of the appropriate systems of waste water treatment and management.

- Promotion of Soil Protection as the Essential Component of the Environmental Protection of the Mediterranean Coastal Areas

The objectives of this action are to: a) promote and support the activities related to the Mediterranean cooperative project on runoff erosion monitoring; and b) organize missions to assist countries in solving specific problems in the field.

- Development of Mediterranean Tourism Harmonized with the Environment

The objectives of this action are to: a) identify problems and experiences in Mediterranean tourism through national reports and demonstration studies to be reviewed by a seminar; b) make recommendations for a harmonized development of Mediterranean tourism; c) prepare documents on the carrying capacity and the EIAs; and d) cooperate with interested countries and national institutions in promoting environmentally sound planning and management of Mediterranean tourism.

- PAP-FAO Cooperative Project on Environmentally Sound Management of Mediterranean Aquaculture

The objectives of this action are to: a) contribute to the identification and protection of the sites suitable for aquacultural activities in the Mediterranean coastal zones; b) promote and support the PAP-FAO cooperative project on environmentally sound management of the Mediterranean aquaculture; and c) cooperate with interested Mediterranean countries in defining development strategies and formulating projects for aquacultural farms in accordance with the necessary environmental criteria.

- Mediterranean Network of the Renewable Sources of Energy

The objectives of this action are to: a) make an in-depth analysis of the successful utilization of solar energy and to promote its application in the region; and b) support and prepare training courses on the practical utilization of the region's renewable sources of energy in conjunction with internationally reputed institutions in this field.

- Application of the Environmental Impact Assessment in the Development of the Mediterranean Coastal Zones

The objective of this action is to contribute to the introduction and the implementation of the EIA in the decision-making process using a simplified methodology suitable for the specific Mediterranean conditions

and thus to contribute to the environmentally sound development of the Mediterranean resources and to the achievement of the Genoa Declaration targets.

- A Balanced Development of the Mediterranean Coastal Zones and their Hinterland

The objectives of this activity are to: a) compile relevant information on the coast-hinterland relationship and to identify ways for their balanced development in the various Mediterranean countries; b) prepare case studies on the subject; and c) formulate recommendations relevant to the subject to be introduced in the process of integrated planning of the coastal zones.

#### 4. THE COAST LINE AND THE IMMEDIATE COASTAL ZONES

The coast line and the immediate coastal zones are of prime importance in the assessment of the impact of climatic changes which are being examined, and especially with respect to the rise in the sea level.

The Mediterranean coast line is very ragged and indented. It often exists in the ratio of 1:5 and even up to 1:10.

Of the total coast length (coast line) which is approximately 46,000 km, 75% is taken up by only four countries: Greece, Yugoslavia, Italy and Turkey. 40% of the coast line make up the islands found mainly in Greece (7,700 km), Yugoslavia (4,024 km), Italy (3,766 km), Spain (910 km), and in France (Corsica 802 km). (Figure 4, Table 7)

According to the accessible data, some 25,000 km or 54% of the total coast length is rocky (rocks and rocky platforms), while some 21,000 km of the coast is made up of accumulation (sandy and rocky beaches, dunes, wetlands, lagoons, estuaries and deltas).

Lately a part of the coast has been artificially turned into beaches by depositing sand or flattening out rocky platforms. This rearranging or reconstruction is for now on a small level, but in Spain it has already reached up to 5% of the coastal length. (see the following Table)

There are no figures on the coastal terrain incline. However, it may be assumed that the main impact of climatic changes or the sea level rise will be felt in the cities most of which are located on the coast line itself. Therefore, the harbours will be affected as well. There are no accessible figures concerning this fact. The only indications for the size of this occurrence are the figures on the areas taken up by cities and settlements which in essence include harbours, all their facilities, and industrial zones. The total area covered by cities and settlements is 14,213 km<sup>2</sup> (Table 8). This is 1.11% of the total area of the Mediterranean administrative regions.

The fact that every kilometer in length contains 2,885 inhabitants is not very relevant or indicative, because it refers to the entire population, even that of the areas adjoining the immediate coastal belt. But, the fact

| TYPE OF<br>COAST                           | COUNTRY |        |       |       |            |         |        |        |        |       |         |        |       |       |         |         |         |       | TOTAL |
|--------------------------------------------|---------|--------|-------|-------|------------|---------|--------|--------|--------|-------|---------|--------|-------|-------|---------|---------|---------|-------|-------|
|                                            | Spain   | France | Italy | Malta | Jugoslavia | Albania | Greece | Turkey | Cyprus | Syria | Lebanon | Israel | Egypt | Libya | Tunisia | Algeria | Morocco |       |       |
| Rocky                                      | % 3     | 64     | 40    | 100   | 80         | 30      | 70     | 60     | 50     | 65    | 65      | 5      | 5     | 5     | 20      | 50      | 50      | 54 %  |       |
| Coasts                                     | km 80   | 1090   | 3181  | 180   | 4893       | 125     | 10500  | 3115   | 391    | 119   | 146     | 10     | 50    | 90    | 260     | 600     | 256     | 25086 |       |
| Coasts created by accumulation and deposit | % 92    | 36     | 60    | 0     | 20         | 70      | 30     | 40     | 50     | 35    | 35      | 95     | 95    | 95    | 80      | 50      | 50      | 46 %  |       |
|                                            | km 2370 | 613    | 4772  | 0     | 1223       | 293     | 4500   | 2076   | 391    | 64    | 79      | 190    | 900   | 1680  | 1040    | 600     | 256     | 21047 |       |

\* plus 5% of artificial coastal beaches

Division of the coasts according to their nature

referring to the area taken up by cities and settlements does have some relative value since that area is usually located by the coast line.

It is necessary to accept that the climatic changes would primarily and most strongly impact that part of the coast which consists of accumulation. This impact would not be just mechanical (both static and dynamic, a consequence of the sea level rise) but also chemical because of the composition of sea water. Thus, the levels of underground waters would rise while the soil would become salinified as would flowing underground waters and aquifers.

The knowledge received from case studies and from other studies plus empirical knowledge of the Mediterranean coast, allows us to accept the following ideas. First, in addition to the primary impact on coastal cities, harbours and on a part of the tourist beaches, a secondary and equally strong an impact would be felt in the lowlands and swampy coastal regions located mostly in the eastern part of the Mediterranean. Second, this impact would also hit the estuaries in the western part of the Mediterranean. This refers mainly to the shores both along the Nile delta and along wider areas of the river Po delta (Roven, Venice, Trieste), to parts of the Albanian coast, to the southernmost parts of the Yugoslav coast (Ulcinj, lake Skadarsko), to the region of Tunis (Biserrta), to the Turkish coast from Adana to Mersin, to the mouth of the river Ebro, to the Neretva and Mirna deltas in Yugoslavia, and especially to the regions around the mouth of the Rhone in France.

## 5. DISTRIBUTION AND DYNAMICS OF POPULATION IN LITTORAL ZONES

At the present time approximately 133 million people, which represent 37% of the population of the Mediterranean countries, live in the littoral or coastal zones which themselves represent only 17% of the total area of these countries (Table 9). About 87 million people live in the urban zones, and this equals 61% of the inhabitants of the coastal zones.

The Blue Plan scenarios show that in the year 2025 there will be between 200 and 220 million inhabitants living in the coastal zones. This will represent up to 39% of the total population; 150 to 175 million of these inhabitants will be living in the cities, and this equals 75% of the population of the coastal zones.

The process of littorization will continue but with much lesser intensity than the process of urbanization. This second process will especially be intense in the southern and eastern parts of the Mediterranean, where today 40 to 50% of the population lives in the urban areas. According to the Blue Plan scenario this figure is expected to reach 70 to 80% by the year 2025 which is the present share of the population percentage in the northern part of the Mediterranean.

The changes in the climatic conditions will have a definite but limited impact, especially in the first years of the sea level rise, on the distribution and dynamics of the population in the littoral zones. This premise presumes that adequate measures for the protection of the inhabited parts immediately next to the coastal line will have already been taken.

According to all assessments the dynamics of natural growth will not suffer from any changes in caused by the sea level rise. It will in fact continue to follow the present trends of population growth in individual countries. These trends are: the decrease of natural growth of the population size in the countries on the North Mediterranean coast, a strong increase of the population size in the countries on the southern and eastern coasts of the Mediterranean. The natural population growth is primarily affected by other factors such as the growth of the standard of living, the growth of the economic strenght, the level of medical care, the cultural level, religious customs, etc.

The mechanical population growth caused by the present process of littoralization will probably not change as well, at least in the first period of the climatic condition changes.

Likewise, changes in the overall growth of the population in the coastal zones is not expected. This is so because the number of inhabitants in the littoral zones which could be impacted represents a relatively small percentage of the total number of inhabitants, while the gradual nature of the impact (occurring over a long period of time) allows the population to adapt.

Therefore, the total growth of the population size in the coastal zones will continue to follow the present trends.

However the distribution that is the redistribution of the numerous people living immediately next to the coastal line will in future time periods

experience the manifestations of the impacts of climatic changes. Nevertheless, this depends on the local coastal configurations and individual settlement structures.

It is very probable that the expected climatic changes will not diminish the predicted speed of littoralization in both the Northern and the Southern Mediterranean. They can only increase this speed, especially in the south where there will naturally be a widening of the desert zone toward the North.

The urbanization process will probably be slower than the one predicted by the Blue Plan scenario. Smaller water supplies, poorer water quality, the need for more purified drinking water, useage of water from farther sources, plus a greater level of waste water treatment and consequent reusal will in the existing cities require greater expenditures for the building of necessary infrastructures. This will raise the cost of living in the cities which will in turn destimulate the process of urbanization.

The temperature rise will make the living conditions less pleasant during the summer months. In unprotected city spaces the temperature will even reach tropical heights. The hot exausts of air-condition systems, which will probably be used more than today, will also contribute to a great extent to the temperature rise. A reduction of their use might possibly and only be caused by a drastic rise in energy prices.

It is necessary to establish firm methods of water management for both private and communal use (the upkeep of greenery and street cleaning) because of the expected reduced precipitations. Because of the temperature rise and in turn the increased evaporation, we may expect that greater amounts of water will be needed for the previous uses, unless this problem is not solved through the reusal of waste water.

If we accept both the fact that the only definite figures on the population size of the coastal zones exist for the political-administrative regions and the basis of calculation the figures of Blue Plan, then in the coastal regions of the Mediterranean in the year 1985 there were 133,483,000 inhabitants occupying a total of 1,280,802,000 square kilometers. This means that 37.55% of the population in the Mediterranean countries inhabited only 15.02% of the area of these countries.

By evaluating the assessments explained in Background Information, we may conclude that maximally 5% of the population would be indirectly affected by the the impacts of climatic changes. This is 5% of the 133,483,000 people living in the political-administrative regions of the Mediterranean, which is some 6,700,000 inhabitants. That part of this number which may directly be affected by the sea level rise is difficult to approximate because it depends upon local conditions. However, that part will most likely not be greater than 10-20% of the number which means approximately 1 million to 1.5 million people. The reprecussions to the impacts may be felt in the need for the removal of housing units and communal infrastructures tied to these units and eventually for the relocation of part of those inhabitants. This need will probably arise only in later years of the manifestations of climatic change impacts.

Problems different from the mentioned ones arise while assessing the number of people living immediately next to the coast. We are already aware of the difficulty in knowing the local conditions and determining the sizes of the administrative regions which may be very large. For some countries the sizes may reach up to 100% of the individual country's area as in Albania, Lebanon, Israel and Monaco. For the North coast this is 39.50%; for islands it is 100%; for the Southern and Eastern Mediterranean it is 30.94%.

The average number of inhabitants per coastal kilometer is 2,885 (from 442 in some countries to 21,250 in Israel), (Table 10). The level of urbanization of the coastal areas on the Mediterranean is 61.21% of the total number of inhabitants (Table 11).

## 6. ACTIVITIES

### 6.1. AGRICULTURE AND FORESTRY

All agriculture is based upon a few natural factors. These are primarily the climate (temperature, precipitation and its distribution, water availability) and then the soil and vegetation. Within the limits of these factors, man through his activity produces goods for his needs that is for his personal use or sale on the market.

Agricultural production in the Mediterranean countries is generally oriented toward food production. The only exception is the growth of industrial plants such as tobacco and cotton in a few countries.

The agricultural areas of individual countries comprise less than 50% of the total area of each country (Table 12). In some countries or specifically in the North African countries, these areas are not more than 10% of the total area. Generally speaking, in recent times the Mediterranean agricultural regions have remained unchanged even though in some highly developed countries such as Italy and France they have grown smaller.

The largest part of the agricultural production takes place in the coastal zones. 40% of the total area of these zones is taken up by the agricultural production.

In the Northern Mediterranean countries and Turkey, the largest part of agricultural production does not take place in the coastal zones. However, this is not true in the Eastern and Southern Mediterranean countries where agriculture is mainly located in the coastal zones. The exception to this is Egypt, whose production takes place in the Nile delta as well as along the shores of this river far inland.

In the Northern Mediterranean there are several large alluvial valleys (Po, Rhone, Ebro). Such smaller alluvial valleys are also located in other Mediterranean countries (e.g. the Neretva and Mirna river valleys in Yugoslavia, the Vardar in Greece, etc.).

In the period after 1970 a large part of the agricultural production was made more modern and intense. The use of fertilizers went up 50%, while the number of tractors increased 40%. But, these changes were not the same in the entire region. The greatest changes were instigated in the most developed countries.

There are significant differences in the current agricultural production of the individual Mediterranean countries. In some countries most of the agricultural lands are being irrigated and fertilized with the use of modern mechanization (Table 13). In other countries this is insignificant. The consequences are major differences in the crop yields. Thus, the yield of cereal crops in the countries of the Maghreb amounts to 10 quintal per hectare, while in the Northern Mediterranean countries it is well over 50 quintal per hectare.

The agricultural production of some countries cannot fulfill the present needs of those countries. The prognoses of FAO up to the year 2000 state that the need for self-produced food will even be greater regardless of the expected and significant increase in the production of a great variety of products.

It is possible to better or increase the existing production by increasing the level of agricultural mechanization, the amount of fertilizer use, the amount of pesticide use, the level of irrigation and by creating new genetic species which will bring greater yields.

The expected climatic changes in the Mediterranean regions may have very far reaching consequences on agriculture.

The sea level rise, which is believed to be the "firmest" uniform occurrence on the entire Mediterranean, will directly and primarily impact the lowlands, the wetlands and the estuaries as described in the chapter on coasts. These lands constitute a very important but not a main part of the agricultural areas due to the quality of their soils.

Most of the Mediterranean agriculture is located on lands which will not be directly and physically impacted by the sea level rise. However, they could ultimately be strongly affected by other factors such as the temperature rise, salinization and the changes in the amount and distribution of precipitations. These factors could also cause changes in the geographical arrangement of individual crop cultures, in their quality, and so on.

A lengthening of the summer dry period may affect the existence of crops or plantations, the incomes of farmers, and the commercial values of products.

The temperature rise will in many ways directly impact agricultural production. It will affect the vegetational cycles. It will move the harvest time into the spring and shift the boundaries of individual crop growth. It will also have an effect on the quality of produce.

The indirect impact of the temperature rise will manifest itself as the following: decreased precipitation (especially in the summer), increased evaporation, lower moisture levels of the soil, increased erosion, decrease in agricultural areas, fewer storms, and as the increase in the sea level which will in turn cause an increase in the salt level of alluvial valleys.

Most of the significant agricultural plants require the greatest amounts of water during the spring or summer or during the periods of least

precipitation on the Mediterranean. The absence of showers in late spring or early summer may significantly reduce productivity in those areas where there is no irrigation. Only irrigation can guarantee a good harvest in the entire Mediterranean region. This will be even more pronounced under the changed climatic conditions, when precipitation decreases, evaporation increases and the soil moisture lessens. The need for irrigation will then be significantly greater than today, since only that will ensure a good harvest.

Simultaneously with the growth of the need for irrigation, the available amounts of water will decrease. To satisfy the needs it will be necessary to use whenever possible closed systems of water distribution and ways of supplying water which will maximally reduce water evaporation. Likewise, it may be necessary to reuse waste waters.

Along with an increase in evaporation and the consequent decrease in soil moisture there will probably be an increase in the number of summer storms in the coastal areas. All this will result in greater soil erosion conditioned by the wind. This will reduce the sizes of agricultural areas if proper protective measures are not taken. The sea level rise may affect agriculture in the alluvial valleys. This rise may directly reduce the agricultural areas if proper protective measures such as the building of dams are not taken. The sea level rise will also contribute to a greater soil salinity, which may in some regions limit soil use for agricultural production.

The temperature rise may have significant effects in the development of various parasites and insects, which may directly affect agricultural productivity and income.

To prevent the mentioned consequences it will be necessary to invest significant funds in building irrigation systems, in taking protective measures against erosion and in erecting dams for protection from the sea.

These actions will make agricultural production much more expensive, and that will have far-reaching consequences on socio-economic relations. We believe that the economically richer countries or the Northern Mediterranean countries will solve these problems more easily. The economically poorer countries of the South, which even today have problems with supplying their inhabitants with food, will in the future be faced with even greater problems.

The particular Mediterranean crops and the advantages of early fruit production may receive strong competition from deeper North. Here the temperature rise with already more abundant precipitation may create very favorable conditions for agriculture which will encourage the northern territories to start agricultural production.

The forest areas in the immediate coastal belt represent limited capacities for timber production. This timber is for the most part abandoned since it is unsuitable for most constructional uses except for some specific needs. These forests have limited capacities even though wood has also been abandoned as a heating fuel.

However, forest areas constitute the basis of the plant and animal ecosystem as well as a strong influence on microclimatic conditions. Also, forests and trees are one of the most typical characteristics of the Mediterranean landscape.

The sea level rise will probably not directly affect the forest areas since there are practically none located on the coast line. This premise excludes the individual small or large groups of trees artificially planted next to the sea in parks and promenades.

However, all other changes (temperature, amount and distribution of precipitation, salination) may greatly affect the growth of forests. Their effects may be intensified since the forests have already been attacked by pollution from countless sources.

In addition to this, the temperature rise and the smaller precipitation in the summer months will surely bring the forest fires to their highest degree. They are encouraged even now by the present temperatures in summer.

It is difficult to assess the agricultural and forest areas in the Mediterranean coastal regions because of the existing level of statistical organization. But, in the attachment some elements important for agriculture and forestry are presented as far as they could be gathered according to Blue Plan (Tables 14-18). A more precise statistical survey of forest fires is also presented in the attachment (Table 19).

The impacts of climatic changes on waters, on precipitations and their distribution, and on agricultural and forest soils are especially locally conditioned, more so than on other things. They require complex reforms in agrarian techniques and technology. Now, since there already exist some more or less hypothetical examinations of the effects of changes in climatic conditions on agriculture: on individual crops, individual plantings, fruits (vineyards) and vegetables, and on the production of produce, and since, the general conclusions of those examinations point out the lack of information and thus the need for further research; it follows that more study of the local conditions of the existing climate, soil, land configuration, precipitation, soil permeability (water retainment) is imperative.

## 6.2. INDUSTRY AND ENERGY PRODUCTION

There are great advantages in locating industry and plants for energy generation, as a specific form of industry, in the coastal regions. This is so because the coastal zone represents a place where two transport systems meet (land and sea transport).

This is the reason why in the last few decades within the processs of littorization there was a "moving" of industry immediately next to the coast line.

This "moving" refers mainly to energy generating plants (thermal power-plants run by coal and crude oil, nuclear power-plants), to basic chemical industry, to oil refineries, and to cement and steel producing factories. These industries have located themselves to coastal regions both for transport advantages and for needs of large water quantities (Figure 6).

These basic or "heavy" industries have primarily developed on the North-eastern coasts of the Mediterranean next to large harbours where they form harbour-industrial zones. Some separate industrial zones have been built on their own harbours as is the case with Maghiera near Venice and Foss near Marseille. Where possible, these industrial zones were built on flatlands next to the coast; so the impact of the sea level rise will be strong. It will consequently require that protective structures such as embankments or dams be built. It will also require the reconstruction of systems dealing with waste waters in places where they empty into the sea.

The tendency of future industrial development is a stagnation of these types of basic or "heavy" industries on the Northern Mediterranean coasts, while on the southern and eastern coasts the tendency is an increase or strong future development of these industries.

There are no existing figures on the number of industrial plants in the coastal regions located immediately next to the coast line. However, according to loose assessments this may be 50-60% of the total capacity of that industry, bearing in mind that some industrial branches are wholly (100%) located on the coast line.

Using the available figures received from Blue Plan on both the Northern and Southern Mediterranean, we may set up the following table:

|                      |            | NORTH | TURKEY | SOUTH | TOTAL |
|----------------------|------------|-------|--------|-------|-------|
| Refineries           | - existing | 32    | 3      | 15    | 50    |
|                      | - planned  | 0     | 1      | 10    | 11    |
| Thermal power-plants | - existing | 28    | 11     | 23    | 32    |
|                      | - planned  | 4     | 5      | 23    | 62    |
| Total no. of plants  | - existing | 60    | 14     | 38    | 112   |
|                      | - planned  | 4     | 6      | 33    | 43    |

In addition to the plants listed in the above table, there are 73 petrochemical plants existing and 31 planned, 28 metalurgic plants existing and 8 planned or being built, plus 56 chemical industry plants existing and 28 planned or being built in the coastal regions of the Mediterranean.

There are no figures on the number of industrial plants located at sea level which may directly be threatened by the sea level rise nor on the percentage of plants which will have difficulties in adapting their systems of waste water disposal to new standards. The manufacture of sea salt will find itself in a critical state even with a sea level rise of 20 cm.

Greater difficulties can arise for those industries which are forced to use mainly fresh-water resources. Any assessment will be hard to make since this situation will vary locally. More importantly, the repercussions of climatic changes on the amounts of available water are basically unknown and are also very locally conditioned.

The problem of energy as a motor force in development and as an indirect producer of CO<sub>2</sub>, which in turn intensifies the "greenhouse" effect, shall not be discussed here. However, it should be said that according to the assessments of Blue Plan, the growth of the need for more energy in the future will lessen the exploitation of crude oil after the year 2000. This need will require that 100-250 units of 1000 megawatt power, which corresponds to 200-375 million tons of coal, be built in addition to the existing energy production plants. This will of course depend upon individual development scenarios.

Keeping in mind that industry represents an economic branch with large capital and that it is usually concentrated in one location, we may conclude that these changes should not create difficulties in the protection of industrial plants and zones from the sea level rise.

### 6.3. TOURISM

The Mediterranean is with respect to international tourism by far the strongest region in the world. For over 30% of the tourists which vacation outside their own country, the final destination is one or more of the Mediterranean countries. In 1984 there were over 100,000,000 visitors on the Mediterranean (Table 20). The domestic tourists, those which visited the shores of their own country, numbered 45 million. This number is probably much too low, since most of the countries do not give enough attention to registering their domestic tourists.

Mediterranean tourism is primarily oriented on swimming and sun-bathing, that is on recreational activities which directly use the sea shore.

Therefore, the immediate coast, its relief and its soil quality and composition on land and in the sea adjoining the land, is of prime importance to Mediterranean tourism.

However, tourism on the Mediterranean appeals to people not only because of the shores fit for swimming and sun-bathing, and the desirable climatic conditions, but also because of the attractiveness of the typical Mediterranean settlements, landscapes and cultural heritage left by the peoples of the Mediterranean.

A large part of the tourist accommodation facilities such as hotels, camps, and youth hostels, is located immediately next to the coast line not exceeding 200-300 meters inland. The location of these facilities at a distance farther from the shore than this may mainly be found in the very developed and luxurious tourist areas.

In 1984 the tourist accommodation establishments covered an area of 2,168,770 x 1000 m<sup>2</sup> of which the hotels took up 203,280 x 1000 m<sup>2</sup> while the other establishments took up 1,975,610 x 1000 m<sup>2</sup> (Table 21). According to the number of beds, the hotels can accommodate 5,082,00 guests while the other establishments can accommodate 28,223,000 guests.

Mediterranean tourism fluctuates seasonally. The number of visitors in the period from June to September is over 50% and sometimes even 70-80 percent larger than in other periods of the year. The high peak season lasts from the end of June to mid-August.

The tendencies for further development in tourism are quite strong. According to evaluations by some Blue Plan scenarios, the expected number of tourists for the year 2000 is from 139 million to 184 million, and this number for the year 2025 is from 219 million to 341 million (Table 22). Tour operators and airline companies believe that the number of tourists will be even higher.

Tourism is also a great "user" of water and "producer" of both liquid and solid wastes which directly go into the sea (Table 23).

Furthermore, tourism as an economic branch will suffer the greatest perturbations from the impacts of climatic changes even in those areas where the sea level rise would not cause major repercussions. Even if the tourist accommodation facilities would not be affected by the sea level rise, it is most certain that a large number of the beaches would disappear or would require substantial investments for reconstruction.

The expected climatic changes will also have the effect of lengthening the tourist season from May to October by creating more favorable weather conditions.

It is difficult to assess the number of tourist accommodation establishments built immediately next to the coast line, but all the facilities are built having beach use in mind.

A special type of tourism, nautical tourism, has stimulated the building of a large number of marinas, sport harbours and berths. They will in essence be harder hit than the large freight harbours.

Blue Plan made one trial at evaluating the pressure of tourism on coastal zones and the coast line (Table 24). This evaluation may give a clearer picture of how direct the relationship between tourism and the coast is.

The impact of the sea level rise on beaches, which are an essential tourist amenity, would be great. Beaches made of accumulation with rocky inclines only a few meters from the sea would be first to disappear. There would also be problems with beaches where large infrastructures located only a few meters from the sea limit beach expansion. But, the problems here would deal with major relocation of these city roads and promenades (Nice - Cannes) or with the relocation of streets and railway lines (coastal stretch between Nice and Cannes, parts of the Italian and Yugoslav coasts).

The impacts of both the sea level rise and temperature rise on water needed for tourism and on waste water drainage are just some of the consequences that will come about in other economic activities and cities. The islands may experience even graver consequences than those on land.

However, the rise in air temperature and sea level may enhance the attractiveness of the continental lakes and of the coastal tourist areas of other seas (Baltic, North Sea).

The impacts of climatic changes on tourism in general, especially the impacts of the sea level rise and the temperature rise, may be difficult to assess without knowing the local situations. These situations should be researched by some case studies of typical coastal regions. Any attempts to relieve the impacts will be faced with great organizational and financial difficulties for at least two reasons. First, tourism is a typical form of dispersional concentrated capital (a great number of small or large tourist accommodation and catering establishments). Second, moneys from tourism must be invested into communal infrastructures of settlements in which these establishments are located and also into structures located outside these settlements.

#### 6.4. TRAFFIC

Traffic in the Mediterranean region has for centuries developed in such a way that maritime traffic was elemental in connecting the various Mediterranean areas, while land traffic connected the Mediterranean region with continental Europe, Asia and known parts of Africa. Therefore, in the past there was no land travel between the individual Mediterranean regions, save the stretch of land from Spain through southern France into Italy.

That situation was present from the end of the last century or beginning of this century when roads and railway lines partially began to be built on the Western Mediterranean. They connected the individual Mediterranean areas longitudinally by running parallel and very often immediately next to the coast line. That trend was continued at the middle of this century by building modern roads longitudinally along the coast in the East Mediterranean and in its African South. In the countries of the South-western Mediterranean where traffic ways already existed immediately next to the coast, fast roads higher and farther from the coast lines were built. The roads transversed the land immediately next to the coast line in a number of sections according to the topographical situation or relief. In some harbours traffic became concentrated. These harbours significantly grew in size and expanded their function by creating industrial complexes within their confines or very close by, in any respect close to the shore. However, the greatest number of harbours located in small or average size cities and settlements remained virtually unchanged and took the function of so called city ports for local passenger traffic and for nautical sport activities of the local inhabitants.

Maritime traffic continued to have the function of connecting the Mediterranean countries, but only in terms of freight transport, while passenger traffic became airborne. Air traffic was similar in developing (a tendency which is still present) as was road traffic in the far past. The relations North-South-North are very emphasized; longitudinal connections have been neglected. In turn, every longitudinal trip across the Mediterranean requires traveling inland and taking a connecting flight.

There are no figures on the lengths of roads and railway lines immediately next to the coast line. According to Blue Plan's assessment the roads and railways take up 10-20 thousand square kilometers of land. A few airports have been built immediately next to the coast (Barcelona, Athens, Split, Tunis, Malta) or on soil deposited into the sea (Niece, Tivat in

Yugoslavia, and others). In the attachments data on the total lengths of roads in the Mediterranean countries is presented without the figures concerning traffic-ways immediately next to the coast (Table 25 & 26, Figure 7).

The impacts of the climatic changes will be very strong and more significant on the harbours than on the roads, railway lines and airports. Bearing in mind that this concerns crucially important and investmentwise demanding structures of strategic and economic significance, there should not be any difficulty in raising funds to combat the climatic changes especially the sea level rise. In addition, the protection from the sea level rise will be primary when protecting cities, settlements, and especially the ports of small and average size settlements.

## 6.5. FISHERIES AND AQUACULTURE

### FISHERIES

From antiquity foods received from the sea have been an important staple in the diets of the inhabitants of all the Mediterranean coastal zones especially of the small islands. With the development of food preservation techniques and faster transport, the consumer region of fresh sea foods spread inland. And so, today there are no obstacles in transporting fresh marine organisms to any place in any Mediterranean country.

The production of sea foods in the Mediterranean countries reaches the level of approximately 4 million tons a year. Even though this amount has been constant for about the last 10 years, there have been significant changes in the consumer structure. In the past there was mainly cheaper and poorer quality fish (sardines, mackerel), while today there are greater quantities of higher quality fish (mullet, perch, dorade).

The needs of individual Mediterranean countries for sea food are basically satisfied through national fishing. However, the annual catch on the Mediterranean is approximately 1 million tons, while the rest comes from fishing in other water bodies such as the Atlantic (Table 27).

Generally speaking there has been a change in the structure of the catch in the past years for a few reasons: the overexploitation of some species, the demands of the market, and the development of specific new techniques in fishing.

Looking at individual countries, we find that major differences exist in the catch structure changes. In the more developed countries of the North Mediterranean, there has been a significant decrease in the catch amount of average quality fish and an increase in the catch amount of high quality fish. In the less developed countries there has been no real change in the catch amount of poorer quality fish.

The change in the catch structure came about through the application of new fishing techniques and was conditioned by investing both human and financial resources.

According to some assessments the present level of fishing is somewhat lower or is already past the allowable catch. This may endanger the existing fish stock. It is probable that individual fish species are caught in amounts that are significantly lower than the amounts which may endanger their survival. However, there are species which in some areas are caught much more than they should be. The consequences of this are reductions in the amounts of individual species and their eventual disappearance (e.g. mackerel in the Adriatic Sea).

For every individual region and for the entire Mediterranean, proper stock assessments, established systems of catch monitoring, and the further development of fishing techniques will enable an optimal catch without the danger of overexploitation or of the disappearance of some species.

Some experts warn that the increase in pollution which comes from the land and goes into the sea will be unfavorably reflected on the total stock as well as on individual significant species by forcing them into farther regions which will make fishing more difficult. Both of these elements may cause a reduction of the catch.

It is very likely that the expected climatic changes as well as their direct consequences will cause a series of changes in the ecosystem. Existing ecological balances and chains will be broken, and new ones will be formed on significantly different levels.

The Mediterranean region is characteristic because it contains species which are heterogenous in every individual area. This is the result of the physical characteristics of biotype which greatly differ. Thus, in addition to rocky shores here are the alluvial shores; in some areas the continental shelf is very narrow, in some it is wide. The Mediterranean as a whole can be divided into parts which differ greatly in their characteristics. All that brings about changes of the ecological conditions. Generally speaking, the Mediterranean Sea is poor with a weak primary production which is the usual limiting factor of fish stock.

The Mediterranean, a transitive region between two continents and two oceans, is characterized by intense cyclonal movements. Cyclonal activity directly affects the dynamics of water-mass movements, especially in shallower half-enclosed regions. The question of precipitation tied to cyclonal activity remains unanswered. A general decrease is predicted for the entire year and for the summer period. However, it is not known whether in some regions of the Mediterranean there will be an increase in precipitation or in turn the inflow of fresh water. If this occurs then in other regions of the Mediterranean there will be a major decrease in precipitation. These non-uniform changes could cause very complex alterations in the physical characteristics of the Mediterranean Sea. In turn, they would cause complex changes in the biological world.

Changes in the amounts of precipitation will significantly influence the change in physical characteristics, especially in the shallow coastal region. If we accept the predictions that on the entire Mediterranean region there will be a decrease in precipitation along with an increase in evaporation, then we may conclude that there will be both a salinity and a sea temperature rise. These changes in the physical characteristics of sea water

will affect the regime of tidal movements and sea water currents which will in turn affect the inflow of nutrients by altering the "upwelling" of deep-sea waters rich in nutrients. The changes in the physical characteristics will also affect the oxygen solubility in the sea.

The changes in the physical characteristics will speed-up the physiological processes of marine organisms. They will also increase the speed of the mineralization process of organic matter.

The rise of the sea level in shallow coastal zones will significantly move the coast line inland. This will cause changes in the lives of the communities found in these zones.

The rise in the sea temperature will in some regions, particularly in the shallow coastal waters, create subtropical or even tropical conditions. That will probably stipulate a greater immigration of numerous plant and animal species from the Red Sea through the Suez Cannal into the Mediterranean region. Some plant and animal species indigenoust the Red' Sea have already naturalized in the East Mediterranean, but in the future they will spread more and more West.

The temperature rise will cause a narrowing of the areas of the semi-boreal elements of marine fauna, while the boreal species will be endangered or might even disappear.

All these things will bring about major changes in the qualitative and quantitative composition of the Mediterranean marine flora and fauna. This means that the economically important populations of marine organisms will also be affected. It is possible that the climatic changes cause subsequent changes in the migratory habits of migrational fish species which constitute the largest part of the annual catch. Likewise, there may be a shift in the distribution of some other economically important species. This may induce these species to occupy different ecological niches. The alteration of niches will probably require significant modification of existing fishing techniques and technology. This may include completely new mechanisms for detecting fish, larger boats capable of fishing in farther and deeper waters, and completely new fishing equipment. All these changes will require significant financial expenditures which may bring about a stagnation in the further development of fishing in the economically weaker countries.

#### AQUACULTURE

Some countries have tried to satisfy the demand for high quality fish by artificial rearing. The amounts of produced fish in comparison to the amounts caught are negligible. In 1987 approximately 26.5 thousand tons of high quality fish were produced. By 1992 this number is estimated to reach 44 thousand tons.

90% of the present production in the Mediterranean is through rearing in lagunes. Other techniques, of which rearing in cages is dominant, are in their primary stages and that only in some Mediterranean countries. The Mediterranean coast provides great conditions for further development of aquaculture. However, uncontroled development often endangers the areas suitable for aquaculture. If the production of fish through artificial rearing

were to be notably increased, then measures for the protection of the suitable areas must immediately be taken. Within the framework of the PAP program in cooperation with FAO, ecological criteria for the rational development and protection of aquaculture in the Mediterranean coastal regions are being developed, so that the Mediterranean countries could on time instate proper protective measures for these areas.

Since marine aquaculture is mainly located in the coastal zones, it is to be expected that the climatic changes and their direct consequences (the sea temperature rise, the salinity rise, the sea level rise) will greatly impact its development. Keeping in mind the fact that marine-culture in the Mediterranean comes from lagunes with an average depth of only 50 cm, it is not difficult to see that the changes may make the existing lagunes completely unfit for production.

It is most likely that new lagunes will be created or that interventions on the existing ones will be necessary.

A rise in both the salinity and temperature of the sea will result in a decrease of oxygen solubility and in an increase of organic matter decomposition. The mineralization process is faster at high temperatures in areas containing large amounts of organic matter. This may cause a significant decrease in the oxygen quantities, or it may even create anoxic conditions. When such conditions are present marine organisms die off.

The sea temperature rise will accelerate the growth of marine organisms in the colder periods of the year. This will make the time necessary for rearing shorter and thus more effective.

The expected climatic changes will also affect other methods of rearing. However, that influence will be less important.

The sea level rise will practically not have any great consequences.

The reduction in oxygen solubility, which will be brought about by the salinity and temperature increase, will affect only the shallower areas. Here the decomposition of unconsumed food and fish excretion may cause a reduction of oxygen levels.

The changes in climatic conditions may alter the effects of pollutants on certain organisms. In other words, the temperature change significantly affects the metabolic functions of the marine organisms. The expected temperature rise may, therefore, create major changes in the bioaccumulation of certain pollutants. This may have a negative impact on some commercially important species. In turn, criteria on the acceptable levels of sea water pollution in areas intended for rearing may need to be amended. Moreover, some existing rearing areas will need to be relocated.

## 7. COMPONENTS

### 7.1. WATER RESOURCES

Water availability is one of the key conditions for development on the Mediterranean. Generally speaking, water is scarce in the Mediterranean region. In many individual areas there is a conflict between different consumers, and also a conflict between the consumers and the natural needs.

Data on water sources, and water consumption is shown in Table 28. The water balance for the Mediterranean region is shown in Figure 8.

Of the total current water consumption of 154,000 million m<sup>3</sup>, about 72% is used for irrigation, 10% for the production of drinking water which is distributed through municipal waterworks, and 16% for industry which is not connected to the communal waterworks.

The level of exploitation of the available sources is high in most countries. In some countries it even exceeds 100% (Israel, Libya), which means that a certain amount of water is reused.

Blue Plan scenarios have estimated the water consumption in the individual Mediterranean countries. A significant increase in the water consumption is predicted for the entire region and for the individual countries.

According to the problems in supplying water which will arise in some Mediterranean countries, it is possible to distinguish the three following groups:

- 1) Countries where available water supplies will remain considerable until 2025 and beyond, where quite a comfortable margin would be left for higher per capita consumption; whether countries with low demographic growth (France, Italy, Greece, and Yugoslavia), or with high growth (Albania, Turkey, Lebanon), provided that efforts are made to harness and control water supplies (including preservation of quality), in any case necessary (especially in countries with higher population growth rates).
- 2) Countries where available water supplies, still satisfactory at present, will be significantly reduced as the sole result of generally high demographic growth (Spain, Morocco, Algeria, Cyprus), but where overall water demands can be met until 2025, mainly by new development schemes, and by large inter-regional transfers of water in countries with very uneven distribution of resources, provides that per capita consumptions remain close to their present levels. Marked increases in such consumptions would quickly place these countries in the critical position of those in the following group, requiring solutions other than the conventional water schemes.
- 3) Countries where present available supplies are reduced or negligible, and where exploitation indexes are already above 100%, or will be by the year 2000. The demographic growth rates in these

countries is low (Malta), average (Israel, Tunisia) or high (Egypt, Syria, Libya). In order to be met, per capita consumption from conventional resources will probably have to be reduced or else the country will have to resort either to exploiting non-conventional resources (fossil water, desalinified seawater) or to importing.

The expected climatic changes will significantly affect the water balance in the Mediterranean region. This is quantitatively impossible to express without more detailed research. Therefore, we will descriptively try to explain.

The decrease in precipitation and the increase in evaporation will reduce the amounts of running surface water and ground water.

Since the distribution of rain water depends upon a number of simultaneous processes which will be affected by the climatic changes, we will briefly describe the impacts of these changes on those processes.

Part of the precipitation volume after reaching the ground infiltrates the soil. Another part stays on the surface as runoff. The level of infiltration and the depth of penetration depend on the characteristics of the rain showers (force, duration, frequency) and on the characteristics of the soil (also on vegetation density or sodicity). Of the numerous soil characteristics, porosity and permeability are the most important. They are dependant on both the soil structure and texture.

Figure 9 shows the dependence of infiltration on the amount of rainfall. The speed of infiltration markedly decreases as the intensity of rainfall increases. Runoff is significantly affected by surface storage and detention ( $SD_m$ ). Figure 10 shows the interdependence of the precipitation volume, surface storage, detention and runoff.

The total infiltration of rain water per unit area may be increased by maintaining high soil infiltrability and also by increasing surface storage.

The decrease in the infiltration speed during rain showers is the result of two main processes: the decrease in the hydraulic gradient, crust formation.

Crust formation is conditioned by the joint action of the kinetic energy of each raindrop and the dispersion effect of rain, which is practically pure water. The chemical and physical characteristics of the soil also affect crust formation.

The term crust represents a compact layer which forms on the surface of the soil by the aggregation of fine soil particles, mainly clay particles, around larger particles through raindrop activity. The permeability of such a layer is a few grades smaller than the permeability of the layer just below.

By examining the formation of the crust, it was found that the electrolyte content of water and the soil sodicity have a significant effect on the infiltration speed, and likewise on the crust formation itself.

Figures 11 and 12 show the effect of soil sodicity and water salinity on the infiltration speed. The speed of infiltration markedly decreases when there is a decrease in the electrolyte concentration. At the same time, when there is a steady electrolyte concentration a greater sodicity of the soil will cause a faster reduction of the infiltration speed and a significantly lower final speed.

The impact of raindrops has two consequences: breaking down the aggregates and enhancing the rate of the chemical dispersion by steering the soil surface (Figure 13).

Crust formed by raindrop impact of saline or distilled water was found to be irreversible when high energy rainfall was changed into low energy rainfall. Changing high energy rain made of distilled water into low energy rain made of saline water was not followed by an increase in the infiltration rate. Crust formed by high energy or low energy rain made of distilled water was found to be reversible to some extent when the salinity of the rain water was increased.

These findings are important for arid and semi-arid regions, where intermittent application of saline irrigation water with relatively low impact energy occurs simultaneously with natural rainfall.

The expected climatic changes will impact the process of infiltration and in turn the amounts of ground waters. A rise in soil aridity and the resulting soil degradation will reduce the volume of water which will infiltrate the ground.

The temperature rise and the evaporation increase will also cause a decrease in water volumes. This will directly cause a rise in salinity levels. In some cases that may make the water unfit for home use as well as for other purposes.

Owing to the sea level rise there may be an intrusion of sea water into the aquifers of the coastal areas. This will bring about a rise in the salinity.

The reduction of the amount of both surface and ground water will cause a series of alterations in the rivers, streams, lakes and aquifers.

The small rivers will have a minimal flow-through for most of the year. Some will even dry up in the summer months. Seasonal streams will move farther North. In the small and shallow lakes there may be an increase in the primary production due to the temperature rise which may create anoxic conditions. The salinity level will also rise. The water volumes in the aquifers will significantly decrease. Due to overextraction of these waters there may be an intrusion of sea water and a consequent salinity rise. Many instances (e.g. Malta) are known where the overextraction/exploitation of these aquifers has resulted in the intrusion of sea water and salinity rise to the point of rendering that water unusable in homes.

A decrease in fresh water sources will be accompanied by a greater demand for water consumption which will be the result of developmental needs

as well as of climatic changes. The greatest water consumption rise will be in agriculture, a field which at the present time consumes the largest quantities of water.

To satisfy the growing demands while the quantities of available water are decreasing, it will be necessary to greatly amend the existing systems of managing these waters. The system of managing water sources must primarily among other things insure the following:

- a. that available water quantities will be protected from any sources of pollution;
- b. that specific water consumption in the individual areas of use be reduced; and
- c. that water reuse be increased.

The realization of these conditions will require that substantial funds be invested for the construction of waste water treatment plants and facilities needed for protecting existing waters from pollution. It will also require investments for the development of technology which will enable a smaller consumption per produced unit. In agriculture for example, the specific consumption may be reduced by constructing closed systems of water distribution which will bring water to the very root of a plant. This greatly decreases evaporation and allows for a more effective water use.

## 7.2. SOIL

The geomorphology of all the Mediterranean coastal zones is marked by a variety and the alternation of the following elements:

- a. large river deltas (Po, Rhone, Nile)
- b. narrow plains with mountainous hinterland
- c. large plains and depressions frequently containing lakes
- d. hills and mountain ranges touching the coastline
- e. coastal dunes typical of the Mediterranean

These geomorphological elements can be found almost in the entire Mediterranean coastal region, but in each zone they are represented in a different mutual relationship.

The parent substrates of the Mediterranean coastal zones are very diverse. The most frequent are limestone, marl, volcanic rock and tuft, clastic sediments, various alluvial deposits, bentonite clay, etc. The major soil regions are shown in Figure 14. The percentage of soil types in each Mediterranean country is shown in Table 29.

Water erosion is an acute problem in the entire Mediterranean region (Table 30). The major factors which initiated the erosion process are:

- rainfall erosiveness,
- high erodability of some substrates (marl, volcanic tuft, aeolian deposits and some loose Pleistocene sediments),
- improper land use,
- inadequate soil cultivation and crop rotation,

- bad forest management,
- frequent forest fires, and
- sodification on arid areas reducing the infiltration ability of the soil.

— An inventory of the erosion processes has been taken and an assessment of the erosion risks has been made only in several Mediterranean countries. The erosion mechanism under the specific Mediterranean conditions has not been fully investigated.

Traditional measures of soil protection from water erosion in the region of fortified terraces are hardly accountable, because they still make mechanization and access by vehicular transport impossible.

In the arid regions of the Eastern Mediterranean, wind erosion is an acute problem.

In the river deltas and the sections of the coast which are composed of soft sediments, beach erosion is a serious problem (Egypt, Israel, Tunisia and Italy).

Land slide is a specific problem in some Mediterranean countries (Cyprus, Greece, Turkey).

Salinization and sodification of soils is a problem closely related to the rational use of water resources. The main form of secondary salinization is the increased salinity of subsoil water (aquifers), which is used for irrigation.

Aquifers become saline because of excessive pumping for irrigation and the intrusion of sea water.

The abandoning of agricultural land has been a widespread phenomenon in the Mediterranean throughout history and is as much, if not more, today. The reasons for such a situation are various:

- decreased fertility of the soil due to erosion, salinization, sinking of the coast, etc.;
- lack of water for irrigation;
- fragmentation of agricultural holdings below the actual limits of profitability;
- discrepancy between the crops raised and the technical and economic requirements of contemporary production;
- submersion of the coast line;
- cultivation on steep slopes inaccessible to machinery;
- countryside and forest fires;
- socioeconomic reasons generating a migration of labor for employment in tourism and industry.

The inequitable distribution of natural resources in some Mediterranean countries resulted in high concentration of the population in their coastal zones (Egypt, Tunisia, Cyprus). The development of tourism, particularly intensified in the last decades, generated large migration flows in all the Mediterranean countries. The result of such a trend was enormous urban

expansion and the irreparable loss of hundreds of thousands of hectares of fertile land. In addition to the loss of fertile land, this represents both a biological and an esthetic degradation of the environment.

The expected climatic changes brought about by the temperature rise will significantly affect the soil.

This temperature rise will most likely not directly bring about those changes. Nevertheless, the indirect impact may be diverse and very great, depending on the local soil characteristics and climatic conditions.

The evaporation increase along with the precipitation decrease will result in the decrease of soil moisture. This will widen the areas without vegetation in the non-irrigated regions. There will be intensified erosion by the wind in these new barren areas.

The decrease in precipitation and the increase in the evaporation will speed up the process of desertification (Table 31).

The climatic changes will also alter the effects of water erosion. Studies on the effects of erosion conducted in arid and semi-arid areas of Israel show that blocking or reducing runoff directly reduces water erosion. As stated in the paragraph on water sources, runoff depends on the characteristics of both the soil and the coast.

Surface runoff, and therefore erosion, can be controlled by increasing the surface storage of the soil, by leaving small rocks and plant remains on the ground, and by dispersing electrolytes on to the surface of the soil. The vegetation cover of the ground greatly reduces surface runoff.

Water erosion should be less intense in the changed climatic conditions since a decrease in rainfall is expected. However, if there were to be an increase in the number of rain showers in the summer months, that is in that period when the agricultural lands are least covered by vegetation, then water erosion might be greatly intensified. It is very probable that this form of erosion will also be intensified in consequence to the increased number of forest fires and to the decreased number of areas covered by vegetation.

According to the existing data at FAO, a large percentage of the surface areas in North Africa and in the Middle East is endangered by the process of salinization. It is estimated that the percentage of the irrigated land which is threatened by salinization equals 50% in the Euphrates valley in Siria, 30% in the Nile valley in Egypt, and 33% in Greece. Salinization is the result of the inefficient use of water, the lack of adequate drainage, and improper as well as inadequate management. This process of soil degradation may become even worse in the expected warmer conditions where it will be imperative to intensify irrigation in order to ensure the necessary quantities of food.

In the changed climatic conditions due to the proliferation of insects and plant diseases, there will probably be an escalation of the use of pesticides. This will enhance the soil degradation and in turn increase the probability of soil erosion. Significant reduction of the soil degradation can be achieved through the dispersion of chemical compounds of short duration. After achieving their purpose they would quickly degrade to simpler compounds which would not be detrimental to the soil.

### 7.3. SPECIALLY PROTECTED AREAS

The Mediterranean region is rich both in areas which have an important biological and ecological value (contain a great variety of species), and also in places which are particularly significant because of their scientific, esthetic, historical, archeological, cultural and educational importance.

Many of them have been preserved through the establishment of national, regional or local protected areas (national parks). Today there are approximately 100 protected areas located in the Mediterranean coastal zones; About 70% of these are found in only five of the Northern Mediterranean countries (Table 32, Figure 15).

Currently there are actions in many countries for the establishment of new protected areas or for the expansion of existing ones. Many of these actions are internationally supported in coordination with the Special Protected Areas Protocol, one of the Protocols of the Convention on the Protection of the Mediterranean Sea against Pollution.

The expected climatic changes will have an impact on existing as well as on future protected areas. The impact and its magnitude will depend on the characteristics of every area, that is on the characteristics of the biotype and biocenose.

The temperature rise will affect both the marine and land biocenoses. It is very probable that the impact on the land biocenoses will be greater because the consequent changes (e.g. decreased precipitation, increased evaporation) will be felt more on the land. The temperature rise will enhance the development of those species which favor higher temperatures. This may cause changes in the existing ecological balances, and in turn create new ones. The land ecosystems will also be more threatened by fires which will be more frequent in the changed climatic conditions.

The sea level rise will bring about numerous changes. There will be a shifting of the borderlines between the land and the sea, which implies the shifting of the borders of the existing biocenoses. Depending on the physical characteristics of the biotype, the sea level rise may cause major erosion which will in turn bring about numerous changes in the region.

The rise of the sea level will also result in various changes of the deltaic regions (e.g. the protected deltaic areas of the rivers Ebro, Nile, Po and Rhone).

It is necessary to gather a great volume of data on the individual regions in order to more specifically predict the impacts of the expected climatic changes. This data must include the following:

- a) topographic maps for every protected region,
- b) facts on the tidal exchanges,
- c) sedimentary facts on the biotype, and
- d) facts on the existing biocenoses and their distributions in the protected areas.

#### 7.4. COMMUNAL INFRASTRUCTURE

Under the topic of communal infrastructure, we will in this document only discuss the system for supplying fresh water and the system for draining, treating and depositing these communal waste waters.

There is little available technical data on the communal infrastructures in the Mediterranean region. There is only general information concerning the supply of fresh water and the systems for collecting and disposing the liquid wastes (Tables 33 & 34). In spite of this, we can predict the possible impacts on these structures on the basis of the expected climatic changes. However, every settlement has its own specific communal infrastructure, and the impact of the expected changes will primarily depend on those specific characteristics. Nevertheless, it is imperative that this problem receives proper attention on the national level.

When discussing the development of the communal infrastructure on the Mediterranean, we must make a distinction between the situation in the Northern part and the Eastern and Southern parts of the Mediterranean. Within such a division there are other divisions between the urban and rural units. The general situation is that infrastructures are most numerous in the cities of the more developed northern countries, then less in the rural areas of the North, even less in the city areas of the South, and least of all in the rural areas of the South.

This means that in actuality there are systems of waterworks constructed in all the regions of the Northern cities, while there are individual regions in some of the Southern cities which do not even have running fresh water. Furthermore, a large part of the country settlements in the North have waterworks, while this is not the case in the South.

Until recently most of the sewage systems in the Mediterranean were constructed so that the liquid wastes were released by the shortest possible path into the sea. In turn, there was a large number of small systems releasing wastes immediately under or just at the surface of the sea. It was difficult to control these releases, and consequently the coastal waters became polluted.

Only recently has there been a change in the conception of that practice. The general belief is that waste waters of a large area should be collected in one place, processed to an acceptable degree of contamination and then released through a long pipeline far into the sea.

This method of waste water disposal allows for the reuse of these waters. This is of major importance to most of the Mediterranean region, that is to areas where there are inadequate water sources. For some time now in Israel there has been no release of waste waters into the sea. After proper treatment all of the communal waste waters are reused mainly in agriculture for the irrigation of industrial crops.

The expected climatic changes will have an impact on the existing communal infrastructure and will require the construction of new infrastructures.

Basically, the reduction in the available quantities of water will make the situation in areas where there is not enough water today even more difficult. It will be necessary to supply some cities and settlements with water from far away sources since the local sources, that is the sources being presently used, will have a lessened capacity and poorer quality.

Due to the temperature rise the rate of growth of various microorganisms in some water sources will increase. This will amplify the water-born environmental health risks. The eutrophic process might be intensified in some sources and rivers. All this will require the construction of equipment and facilities for fresh water purification which there are none today. This will also significantly increase the price of fresh water. It is estimated that the price may even be double.

The sea level rise may endanger the sewage systems in areas where they are positioned low. Unfortunately, that is the case in most of the coastal cities whose sewage systems also serve to collect rain water. The sea level rise may make the drainage of waste waters more difficult. When there are rainstorms the waste waters may flood the lower parts of these cities.

However, the shortage of water will require the reusal of large quantities of waste water, and this will in turn require the construction of completely new sewage systems and facilities for waste water treatment.

#### 7.5. HISTORIC SETTLEMENTS

A large number of generally speaking important cities and settlements is located in the coastal regions of the Mediterranean; their typology (typography, morphology) is very different. The coasts of all the Mediterranean countries abound in cities and settlements as well as in architectual structures outside of the cities, which belong to various architectual and urban types. They date from many different periods. There are evidences of great civilizations of antiquity, of medieval cities belonging to West-european and Byzantine cultures, of North-african cities belonging Islamic cultures, of numerous cities of more recent times which served as forts or as trade centers, and of modern settlements built by the development of tourism and industry.

In many Mediterranean cities all these evidences may be found located one next to the other. This gives a specific value to these towns, while at the same time it creates major problems in their protection and worth. The problems which arise through the protection of the historic settlements, even though they are specific for every individual city or monument, do have much in common. This primarily refers to the following:

- a) deterioration of cultural values especially those that have not been preserved so far or those that are not very important. There is a much greater percentage of unprotected ones.
- b) economic degradation which is characteristic of the historic zones of the larger towns or of entire smaller settlements.

- c) social degradation primarily refers to old cores which have lost social balance either due to abandoned "living" functions or to overcrowded activities;
- d) the results of the above development can be especially seen in the last few centuries through general neglect of the historical zones, architectural and public utilities deterioration, hard housing and hygienic conditions, and worn out infrastructure.
- e) the functions of the historical zones are not adequate to their importance: old cores and other zones have, in many cases, remained without their vital functions.
- f) disorganized traffic, especially vehicular, deforms the historical and ambient values of old zones and becomes a physical menace to them.
- g) industrial construction in the surroundings of the historical settlements means their visual degradation and is a cause of hard ecological problems in the wider historical environment.
- h) construction for the purposes of tourism also means the degradation of the historical-ambient values of the old settlements unless it is in accordance with the best interest of cultural heritage. Some Mediterranean countries also bring forth specific problems among which special attention should be given to the preventive protection of the cultural values in earthquake zones.

All the Mediterranean countries try to protect their historical heritage (monuments, culture, etc.), and for that they have established organizational and legal systems. Moreover, every country has a specific system which is significantly different from that in other country.

In the coastal areas of the Mediterranean there is a significant number of urban units as well as individual structures which are registered in the list of the World Cultural and Natural Heritage.

Some of the urban units and monuments are of such importance that major international help is included in their restoration and rehabilitation. One such example is Venice, a city located on a lagoon, which has enormous cultural, artistic and ambient values. Venice is gradually sinking, and the rising waters are causing great damage to it.

The expected climatic changes and their direct consequences will have an impact on the historic settlements and monuments.

The predicted sea level rise will endanger all those monuments and settlements which are located at a height just above sea level. As we have already mentioned, Venice will find itself in a particularly difficult situation.

The expected temperature rise and the resulting climatic changes along with air pollution may have a significant affect on the erosion of monuments

and buildings. This may present a problem in terms of the stability of the structures themselves. The serious damage to the Acropolis brought about by air pollution is well known.

Every historic monument or settlement is in itself a specific problem. Only through research and analysis of the individual cases will it be possible to predict the probable impacts.

However, these impacts will only indirectly affect the protection and reconstruction of most of the historic settlements and monuments. That is, the climatic changes in the socio-economic development, and this may have adverse effects on the reconstruction and the rehabilitation of these historic settlements and monuments. The negative impact may be manifested both through the reduction of funds needed for the reconstruction of these sites, and through the development of activities which may directly or indirectly cause negative effects on the historic sites.

It is very probable that it will be more difficult to raise funds for the protection of the historic sites in the countries which are relatively poor and already have difficulty with this. This is evident since significant amounts will go toward the alleviation of the negative impacts on various activities brought about by the climatic changes (e.g. the construction of irrigation systems in agriculture).

## CONCLUSIONS

The impact of climatic changes on the socio-economic structure and on coastal activities such as tourism or industry as well as on the cities and the distribution and dynamics of the population in the Mediterranean coastal zones, has been included in the research by the Task Team only recently, just a few months before the beginning of the meeting in Split in October of 1988. All earlier attempts to include this topic as part of the cooperative work of Blue Plan and the Priority Actions Program under MAP failed. Thus, the beginning of the work on this study dates back to May of this year.

Since the studies of BP and of PAP represent the only systematic studies of the socio-economic structures on the entire Mediterranean, then those works had to be used as the starting point for the assessment of the constant influence of the climatic conditions on the socio-economic structure and activities. The data was sorted out so that the available facts and figures on the manifestations of the impacts of climatic changes on the environment as the basis of all human activity could be found.

It was found that Blue Plan had available only general data on the Mediterranean countries and the administrative regions, but that it had relatively few precise facts on the activities in the coastal zones.

PAP which is studying specific cases so that experience from activities which are of great importance to the environment could be shared and used, was included in the entire project at too late a time. In turn, the attempts to change the activity schedule of PAP on the impacts of climatic changes on the socio-economic structure did not fully achieve their purpose.

I. The primary assessment of the impact implications of the climatic changes on the socio-economic structure can be divided into the three following ways:

1. Increased expenditures for the protection from the effects of the climatic changes
  - 1.1. for the protection of the low coastal areas from the sea level rise (rural, city, tourist and harbour areas),
  - 1.2. for the protection of the sources and locations of the fresh water supplies from the intrusion of sea water, and
  - 1.3. for the adaptation (reconstruction) of the waste water disposal systems.
2. Possible decline of agricultural production, or increased expenditures for the production of food and other agricultural products.
3. Increased expenditures for studies of the local and microregional conditions which may be affected by the climatic changes.

The impact of climatic changes on the socio-economic structure and activities as well as the consequent reactions in the form of protection, alleviation and adaptation to these changes, will depend to a large extent on the local situations, unlike the natural systems which depend on the general situation. In other words, it is easier to predict what will happen to the natural systems by knowing the general situation than how the socio-economic structures and activities will act since they are locally conditioned.

II. After we have accepted the fact that that the main consequences of the impacts of climatic changes will be felt as a rise in expenditures by socio-economic structures and activities, we may conclude on the basis of already witnessed protection from high sea waters and powerful storms, that the expenditures for the alleviation of these impacts will be easily covered without greater problems in the countries with higher national incomes. The countries with lower national incomes (Gross National Income - GNI and Gross Domestic Product - GDP), that is the developing countries, may have great difficulty in covering the expenditures for the alleviation of the impacts of climatic changes.

The alleviation of these impacts will have to be included in the framework of the national strategy and in the general plans of any country. It should not be left solely to burden the local authorities and the economy of the coastal zones.

III. The complexity of the socio-economic structures has the inherent quality of being slow to react to major changes both expected and long-lasting. These structures are slow in adapting, taking 20 to 30 years, sometimes even more, to complete the process. In spite of the awareness of the facts that the climatic changes will exert their impact over decades or centuries and that the first effects will be weak, it is nevertheless imperative to set in gear even now the machinery of social and political decision-making and to take measures for the alleviation for studying these impacts on the socio-economic structures and activities as well as for developing possible preventive steps against them. Furthermore, in addition to

previous studies of what will generally happen, it is necessary to start studies of a local or regional nature to find out how it will happen. In doing this great attention should be given to researching problems that could come about in the given overall or local conditions by starting local studies of the physical conditions, of the organizational problems and of the application of the most appropriate technology for the alleviation of the impacts of climatic changes. However, the fact that these impacts are very linked to the problems of energy, industry, agriculture and the environment as well as the knowledge that significant uncertainty exists with respect to their effect on the socio-economic structures, both point out that it is very difficult to make firm assessments and proposals of what the social-economic structures should do to alleviate these impacts. In any case, the measures taken should at first be tentative and flexible so that later they may become more defined through their application.

The following is a possible list of guidelines for beginning the action of protection:

1. Making the public as well as the structures of all levels (the economic, political and decision-making structures) aware of both the possible consequences of the changes in the climatic conditions and the need for steps leading to their alleviation.
2. Making clear the need that the action for alleviating the consequences of the impacts must be a national action. It should not be left up to the local authorities or the coastal zones.
3. Researching the local conditions. This includes: taking inventory of the coastal zones; and collecting data on the local impacts by the sea level rise and the temperature rise on water, soil, precipitation and individual socio-economic activities.
4. Developing an intervention strategy which will react to the changes in the climatic conditions even in their beginning stages keeping in mind the continuity of those changes, since it would be irrational to calculate expenditures for only a given moment when the effects are still minimal (e.g. sea level rise of 20 cm) and in a few years make additional investments when the effects have increased.
5. Instituting cost-benefit analyses and established methods of Environmental Impact assessment in order to evaluate the feasibility of every expenditure for alleviating the impacts of climatic changes.
6. Developing technology for the alleviation of these impacts on a local, regional and general level.
7. Coordination of all those activities in the entire Mediterranean region.

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Figure 1 : THE MEDITERRANEAN REGIONS. Area taken into consideration for tables  
N° 1a/General Information and III-6 ("Soil")

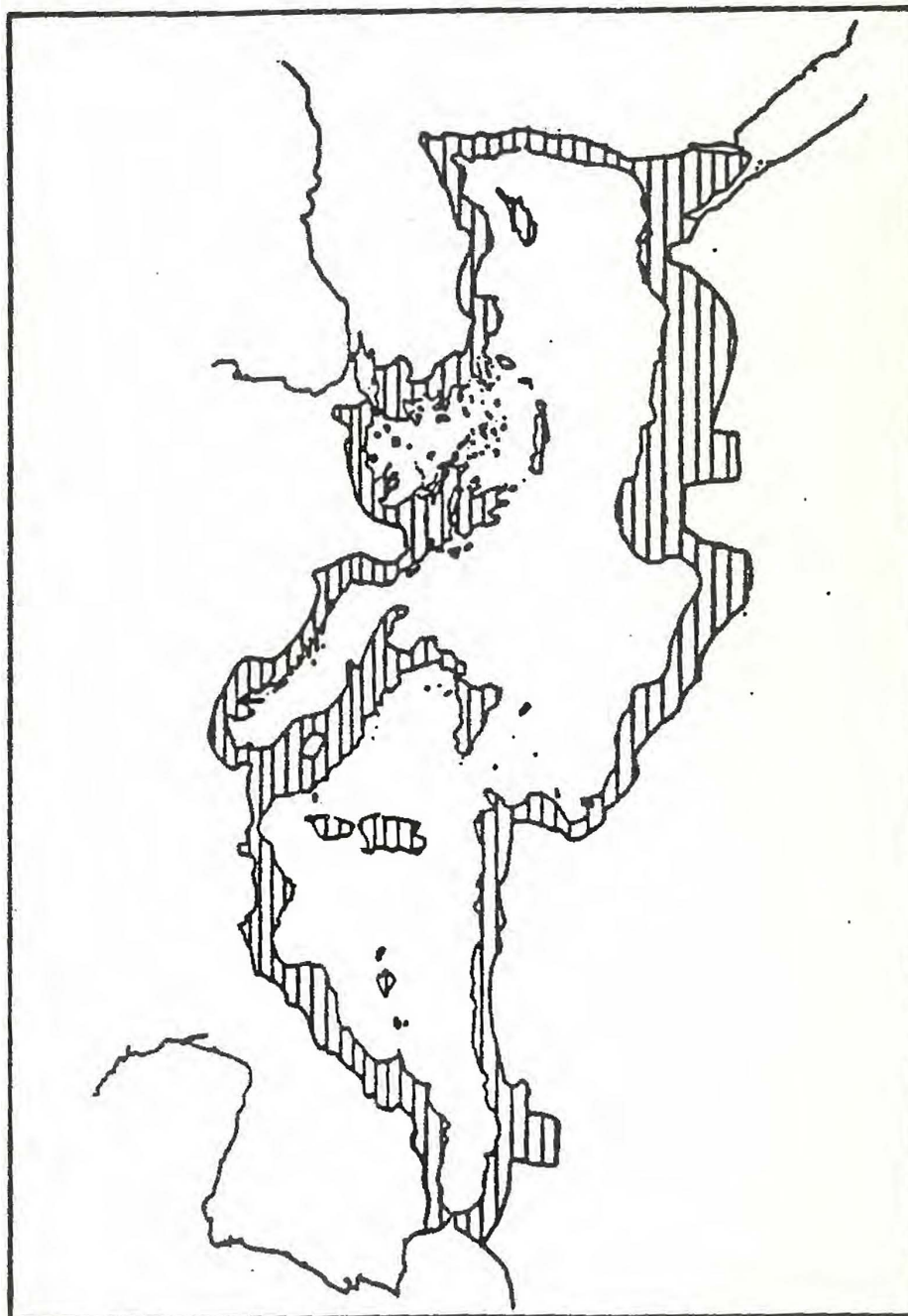


Figure 2. GROSS NATIONAL PRODUCT per capita  
EVOLUTION DU PRODUIT NATIONAL BRUT  
1976-1983

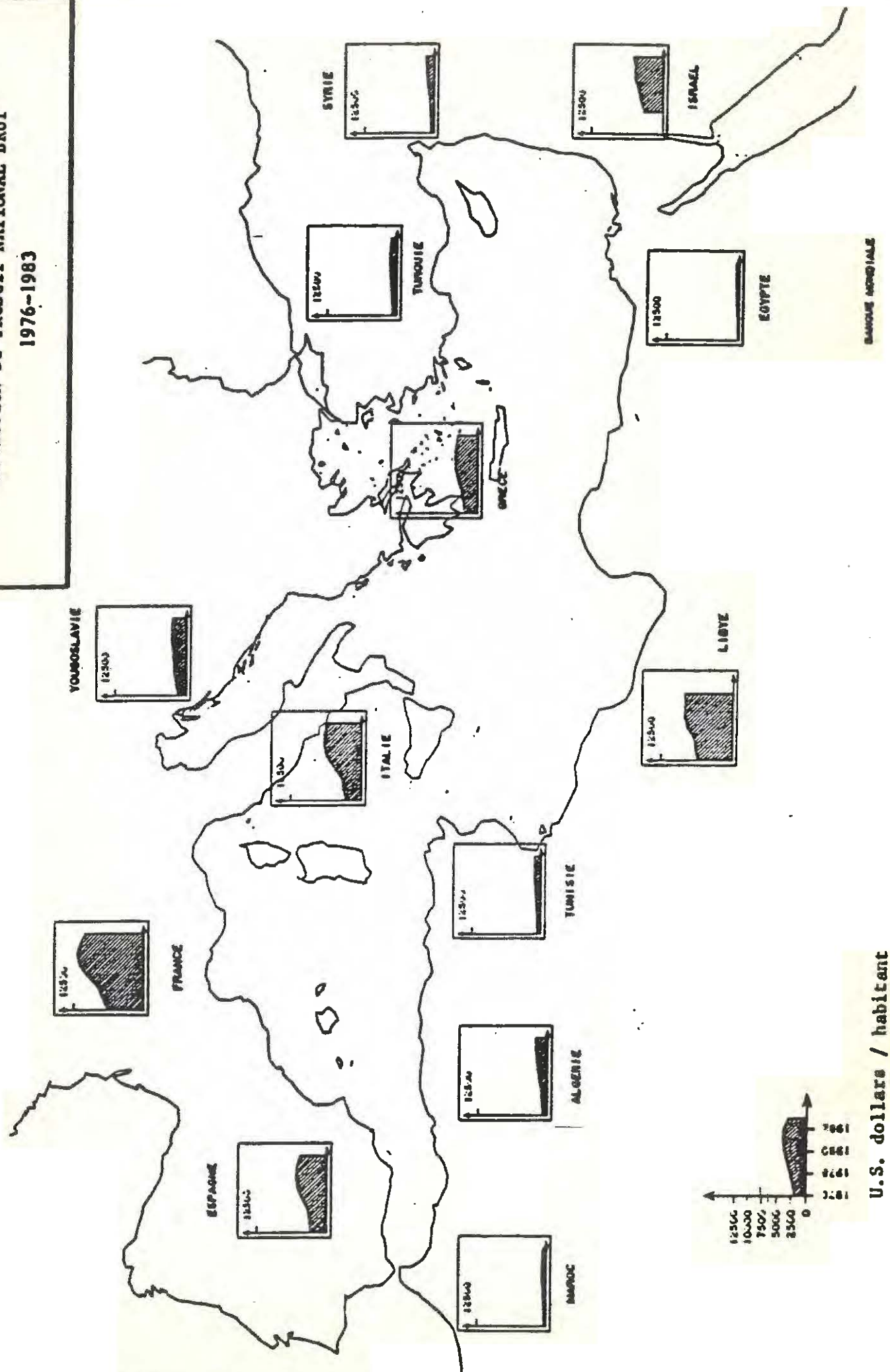


Figure 3. GROSS DOMESTIC PRODUCT  
PRODUIT INTERIEUR BRUT  
REPARTITION 1982

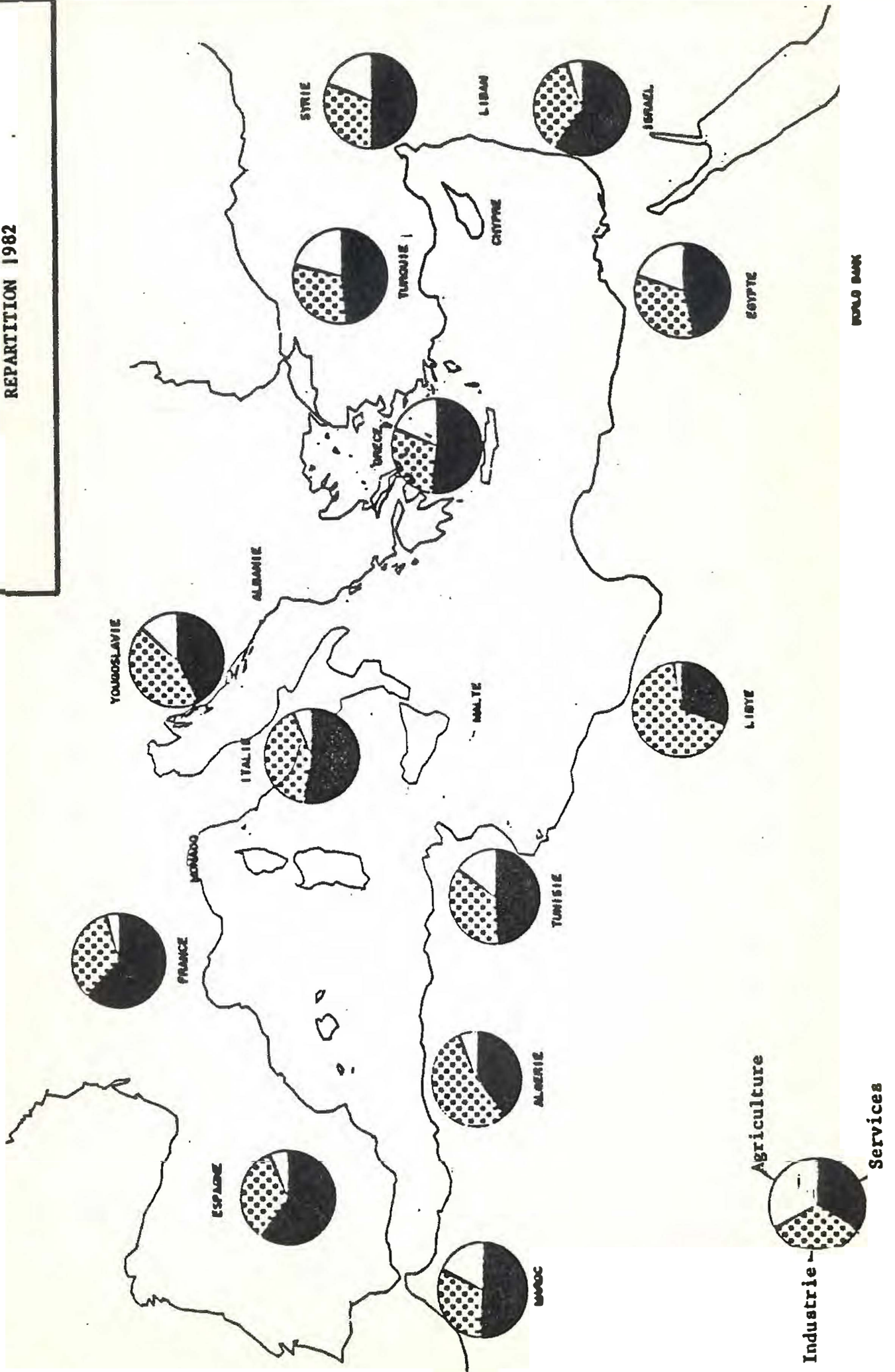


Figure 4 : MEDITERRANEAN COASTLINE, by coastal country, in 100 km and ratio continent/islands

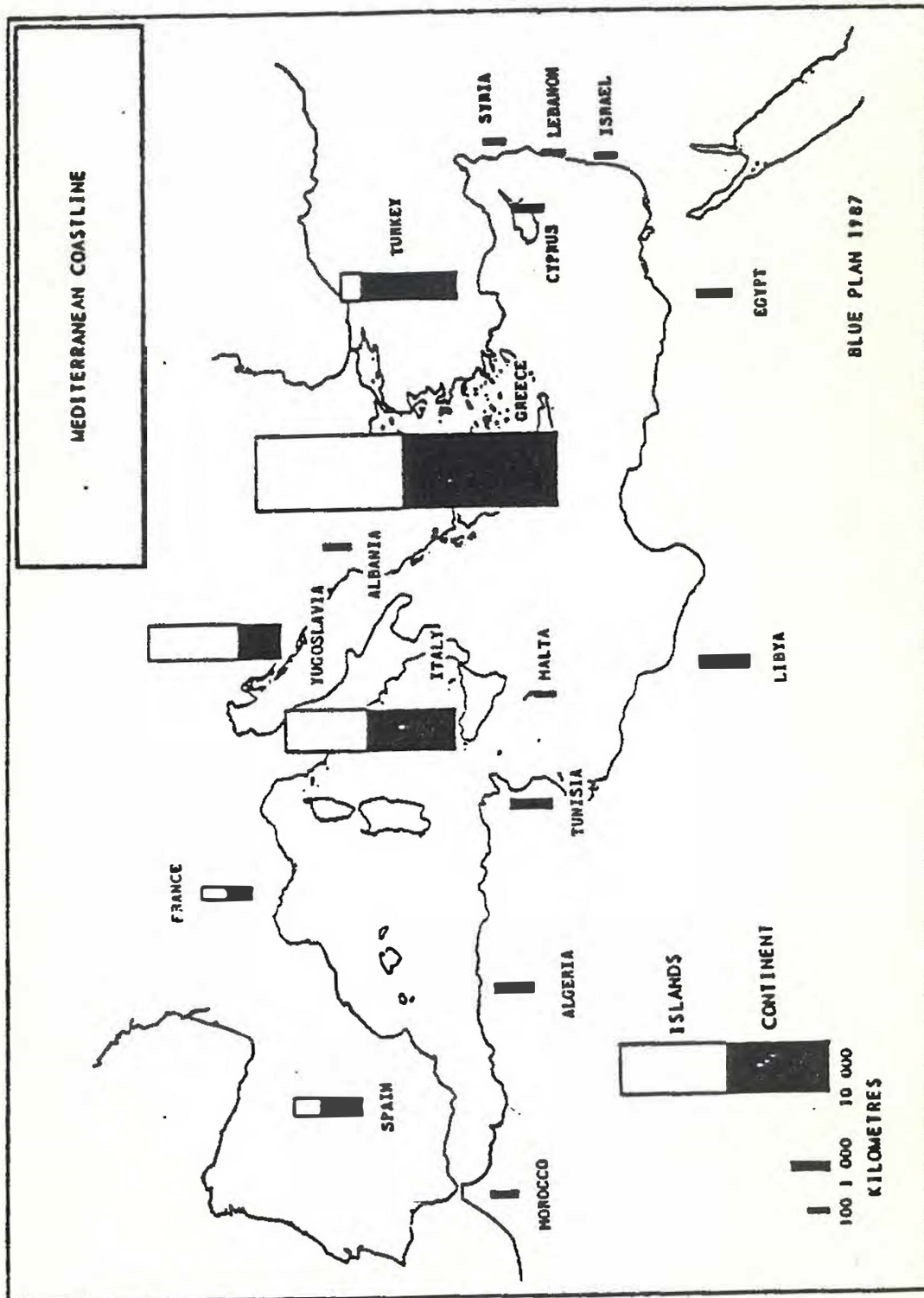
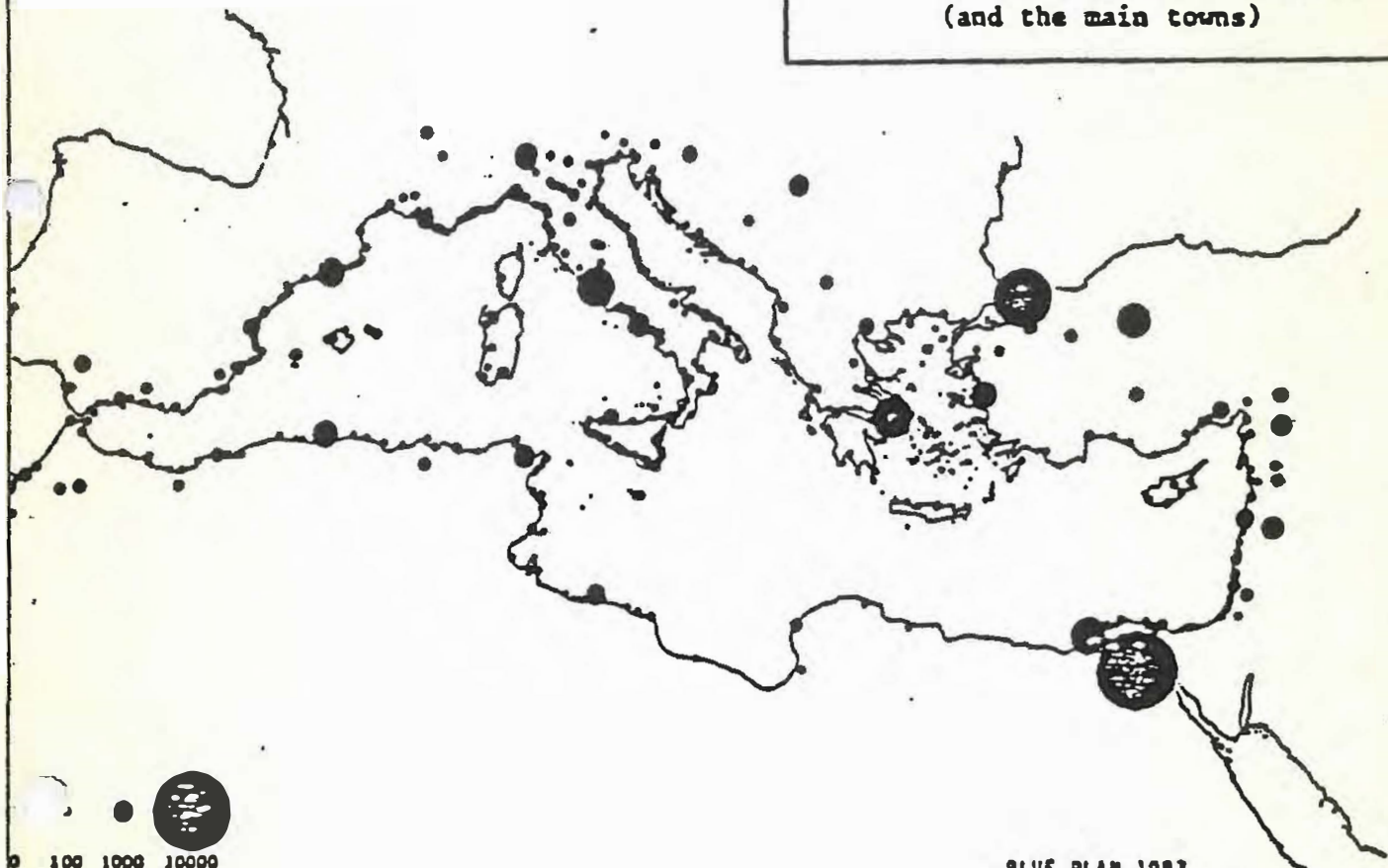


Figure 5  
TOWNS OF THE MEDITERRANEAN COAST  
(and the main towns)



100 1000 10000

Thousand Inhabitants

BLUE PLAN 1987

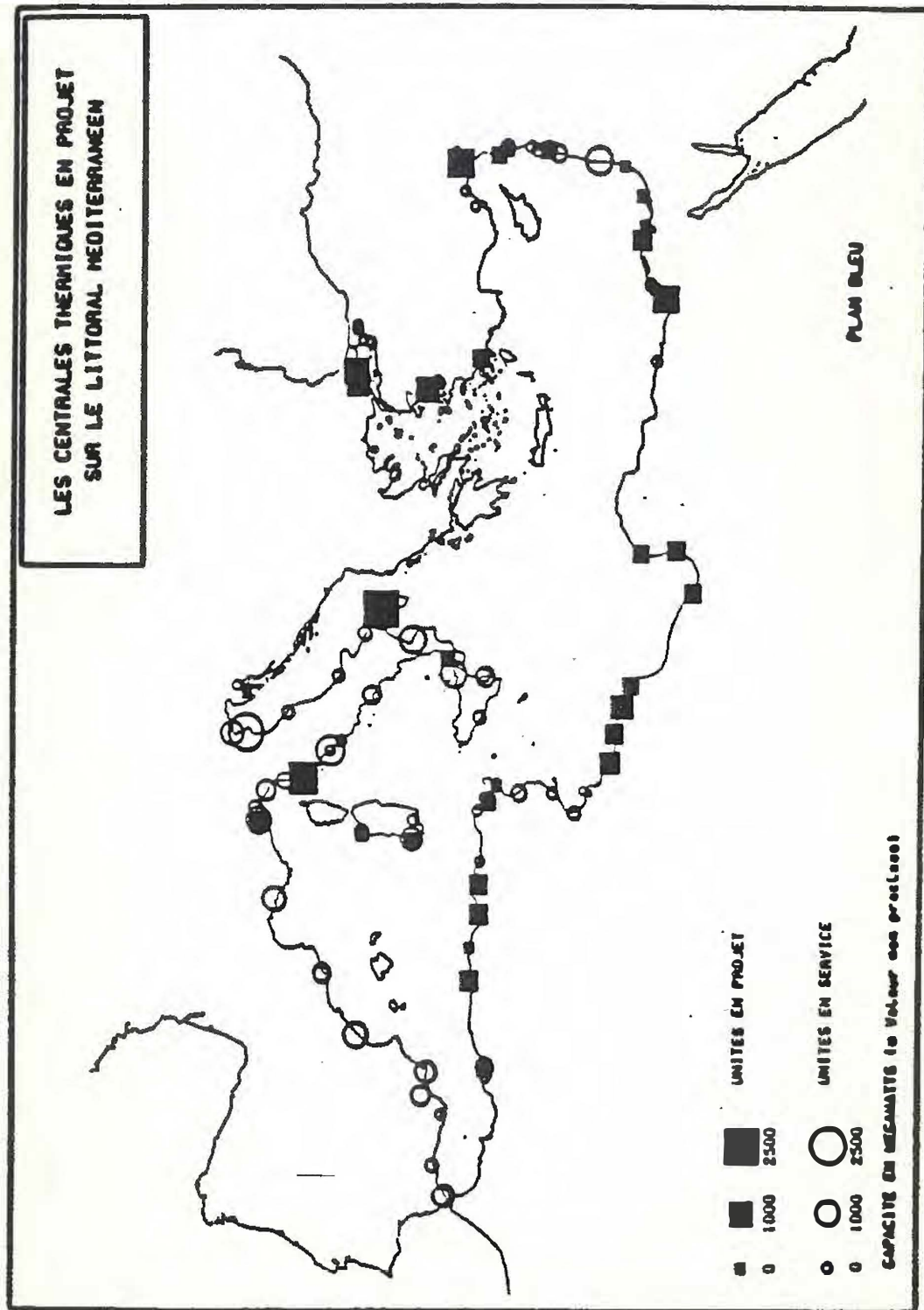


Figure 5. THERMAL POWER-PLANTS LOCATED IN THE COASTAL ZONES

Figure 6 : OIL PORTS: Loading and unloading ports on the Mediterranean coast, 1986

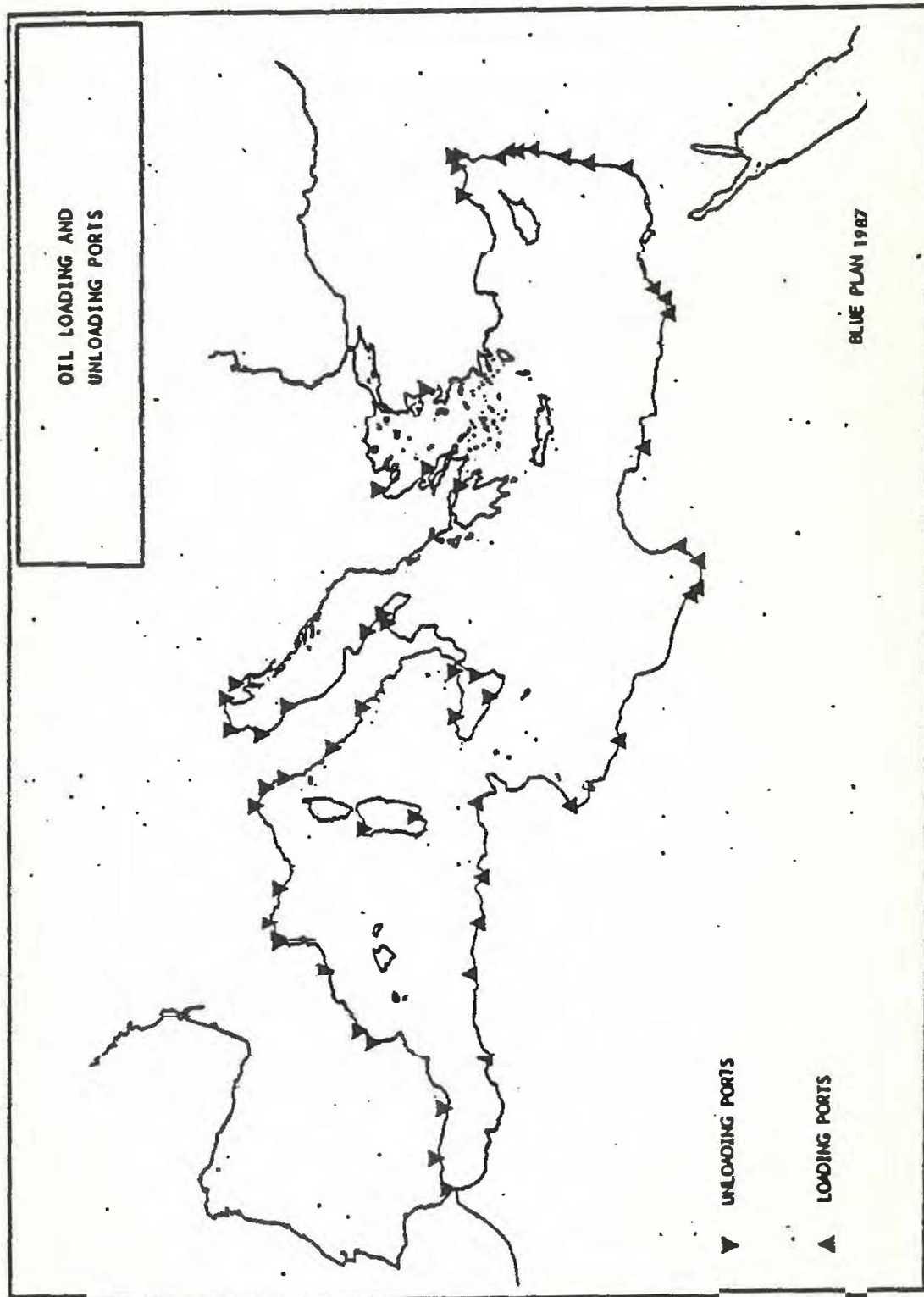


Figure 7. Mediterranean Basin water balance

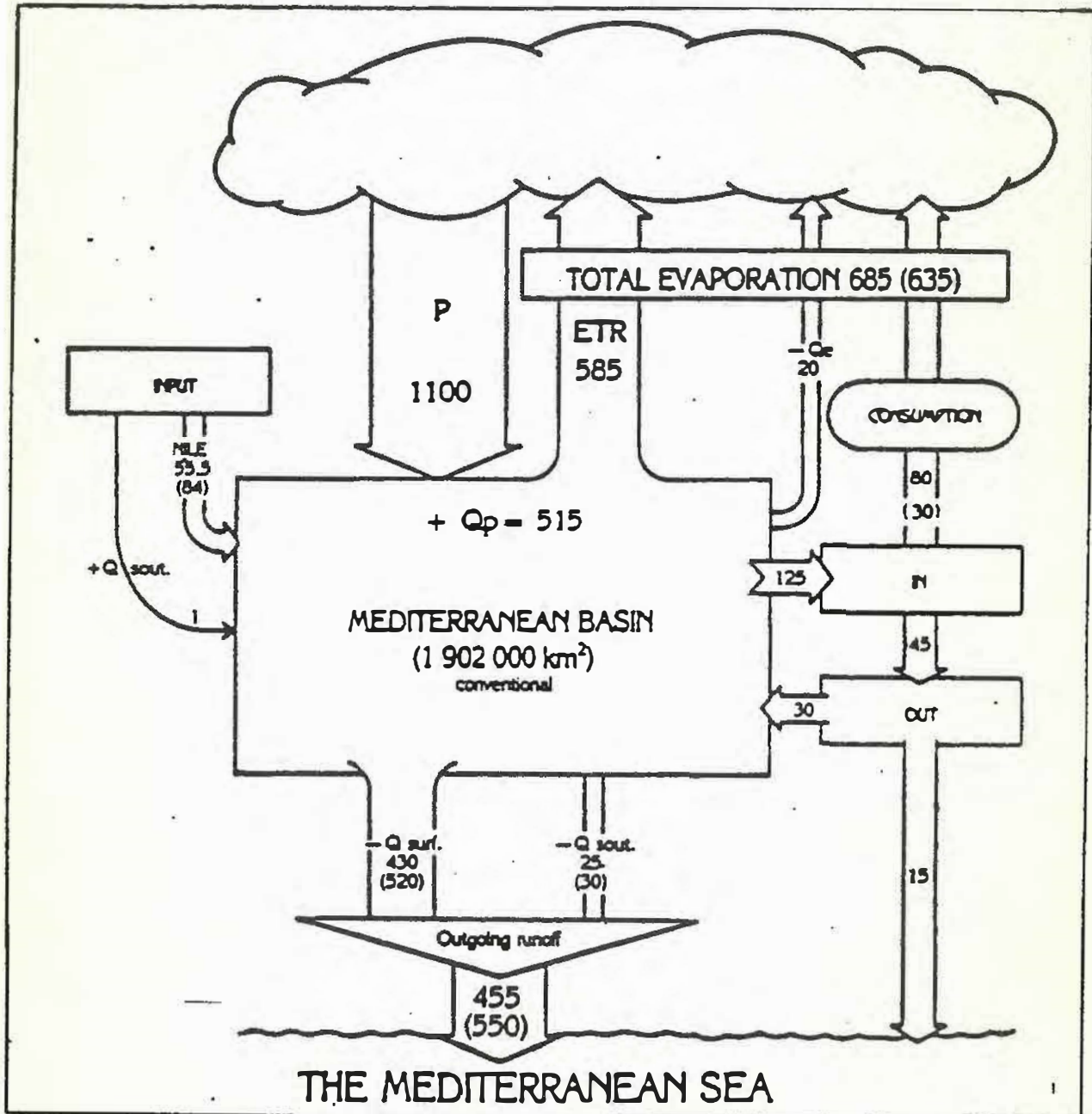
(Current mean flow, figures in brackets = previous flow rates)

Source : J. MARGAT

Unit : billion m<sup>3</sup>/annum

P : Rainfall.

ETR : Real evapotranspiration

+ Q<sub>p</sub> : Runoff potential (= effective rainfall)- Q<sub>e</sub> : Runoff loss via evaporation+ Q<sub>sout</sub> : Underground input- Q<sub>surf</sub> : Outgoing surface runoff → sea- Q<sub>sout</sub> : Outgoing underground runoff → sea

Outgoing runoff : Mediterranean → Atlantic =  $50\,500 \times 10^9 \text{ m}^3/\text{year}$   
 Incoming runoff : Atlantic → Mediterranean =  $53\,000 \times 10^9 \text{ m}^3/\text{year}$   
 i.e. a positive annual balance for the Mediterranean Sea of  $2\,500 \times 10^9 \text{ m}^3/\text{year}$ .

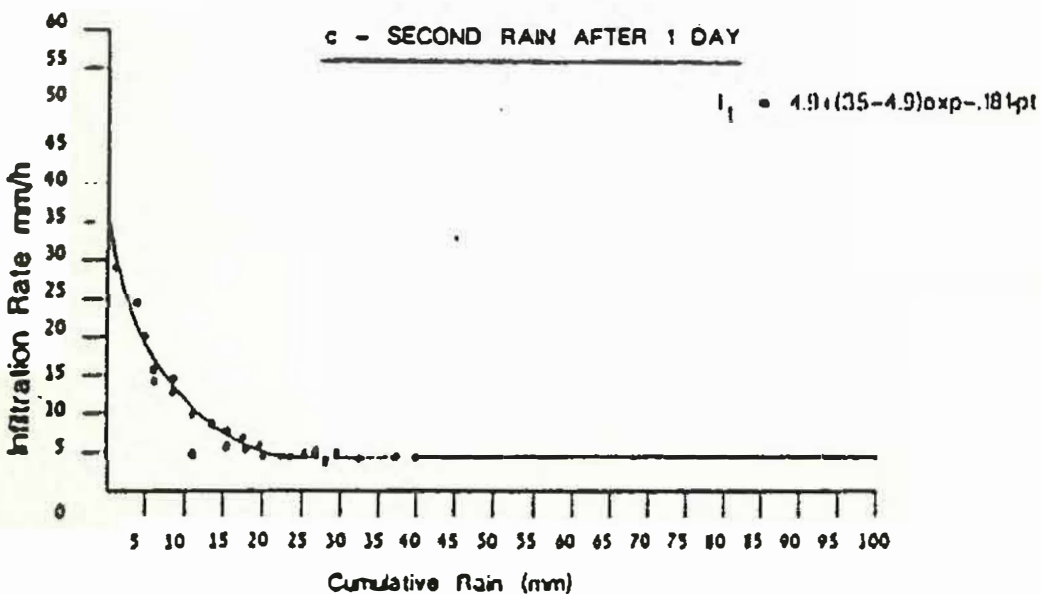
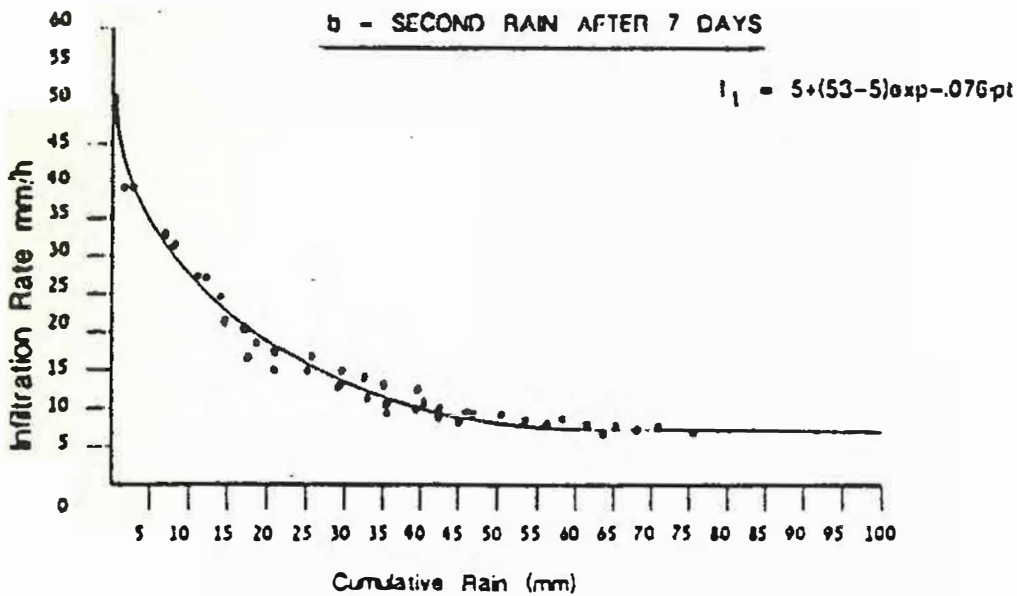
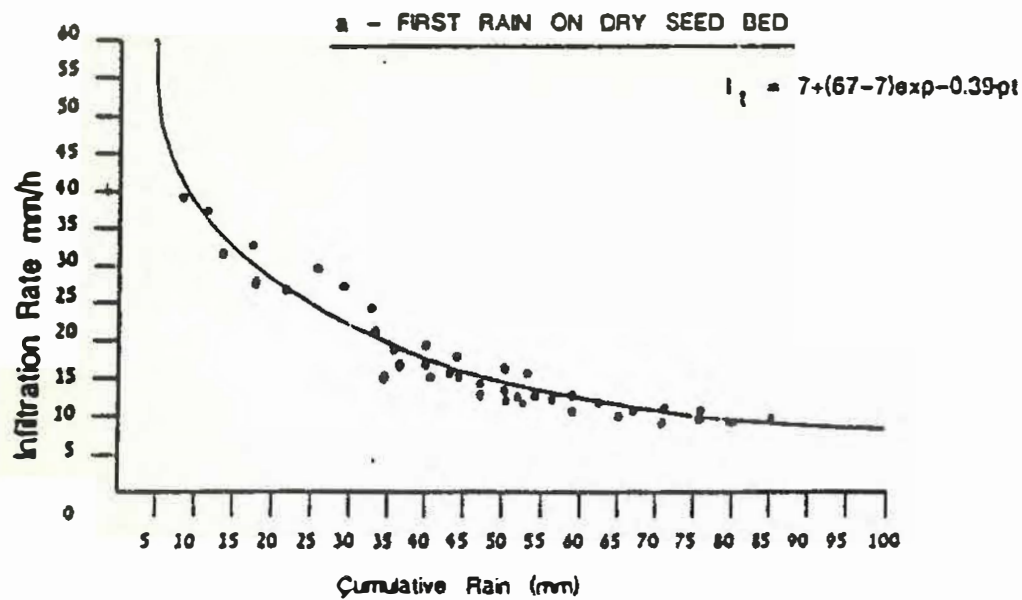


Figure 8.

Infiltration rate as a function of cumulative rainfall, for different rain storms cycle

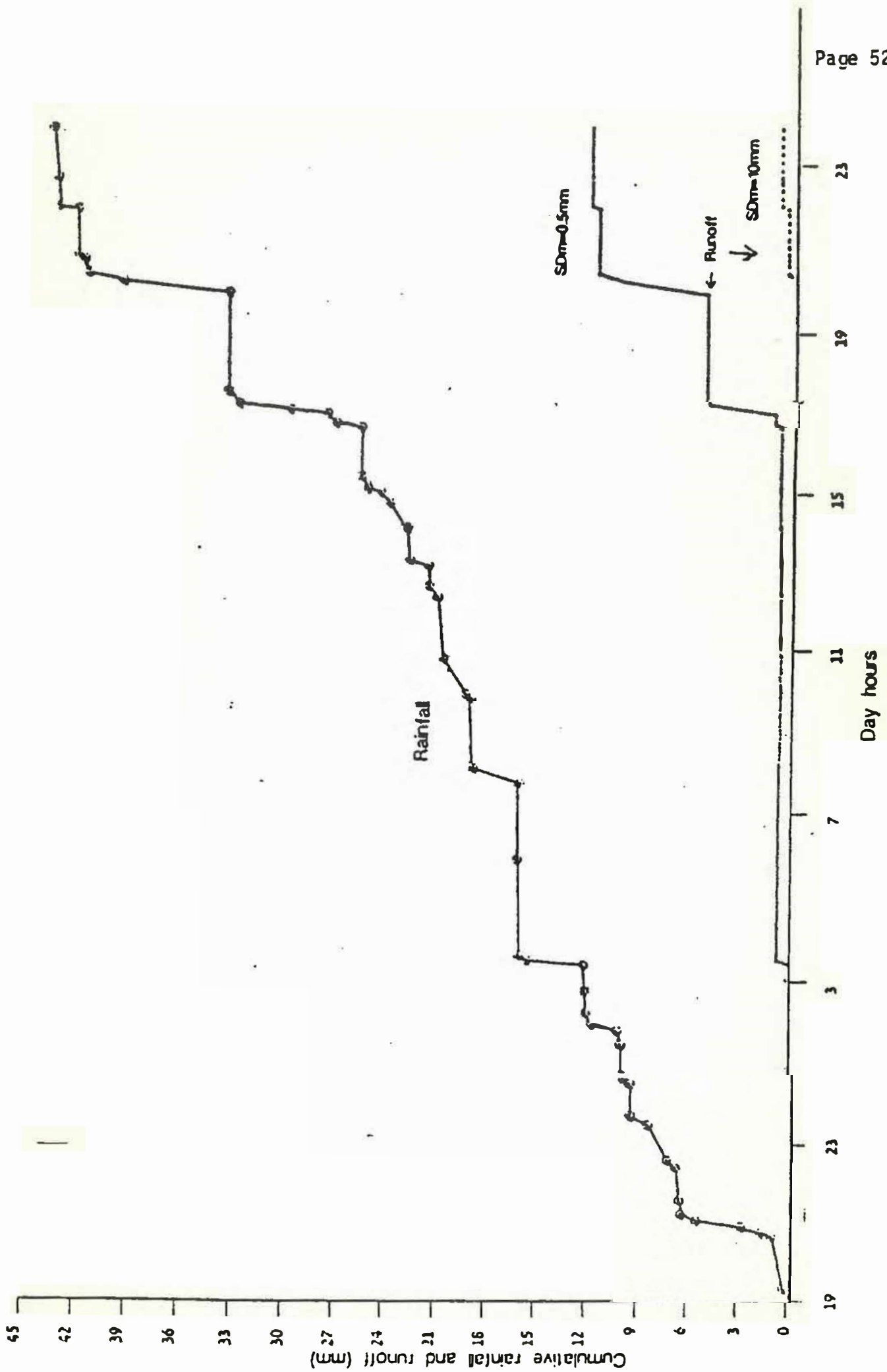


Figure 9. Cumulative rainfall and runoff for the 26/01/84 rain storm in shresh.

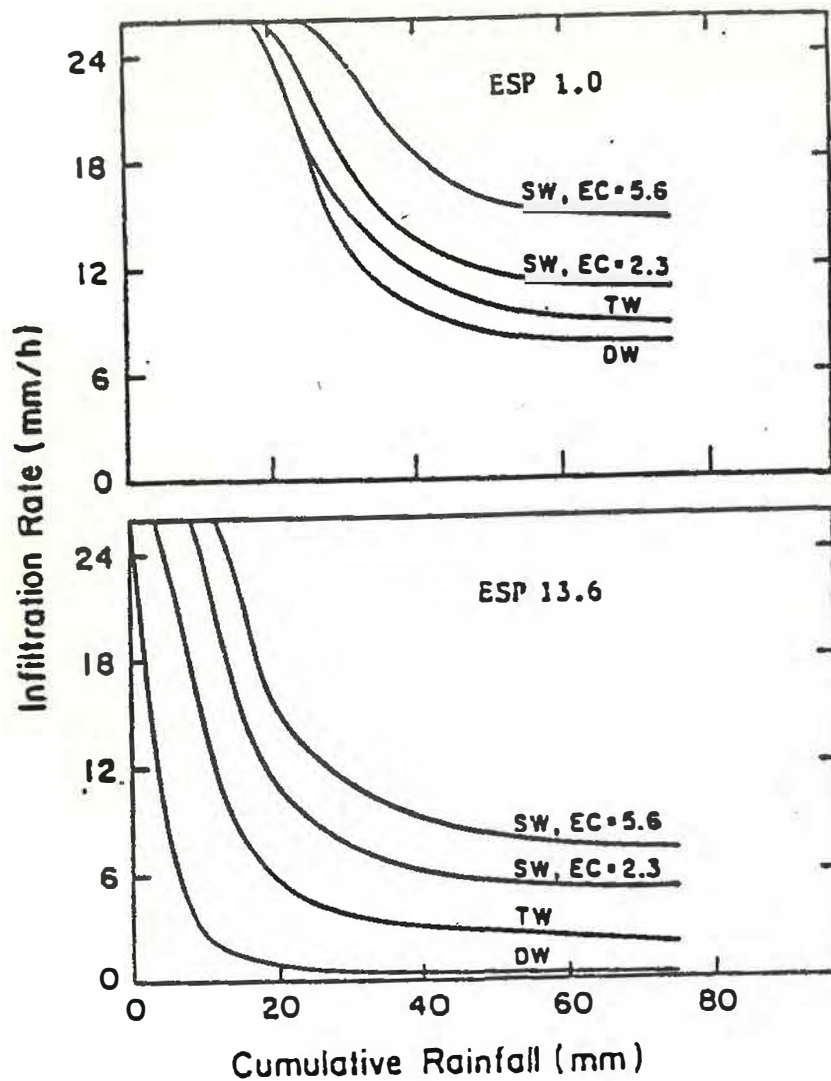


Figure 10. EFFECT OF ELECTROLYTE CONCENTRATION IN RAIN SIMULATION EXPERIMENTS ON THE INFILTRATION RATE OF CHROMIC LUVISOL SOIL

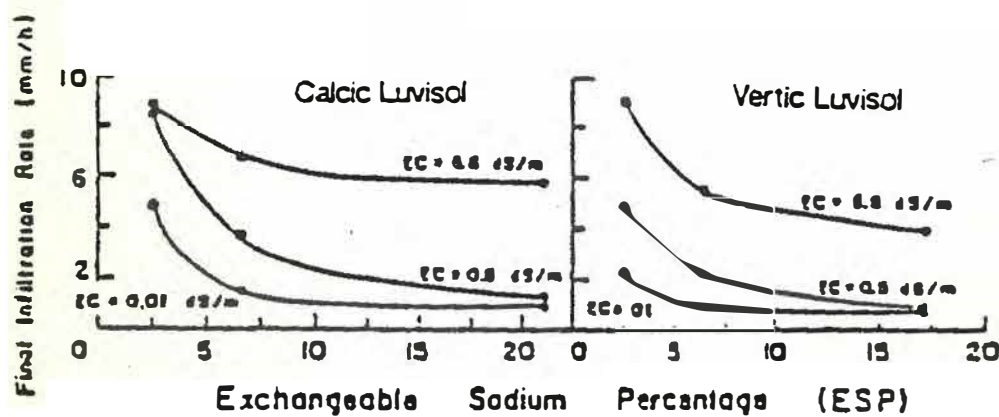


Figure 11. EFFECT OF ESP AND ELECTROLYTE CONCENTRATION ON THE FINAL INFILTRATION RATE (FIR) OF THE CALCIC AND VERTIC LUVISOL EXPOSED TO HIGH-ENERGY RAIN

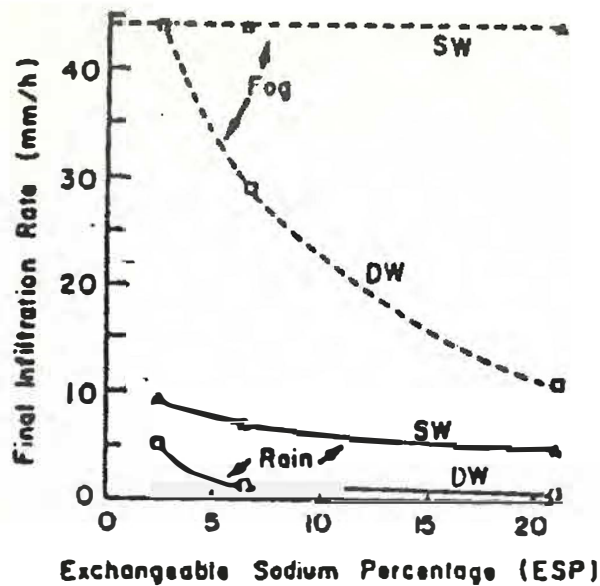
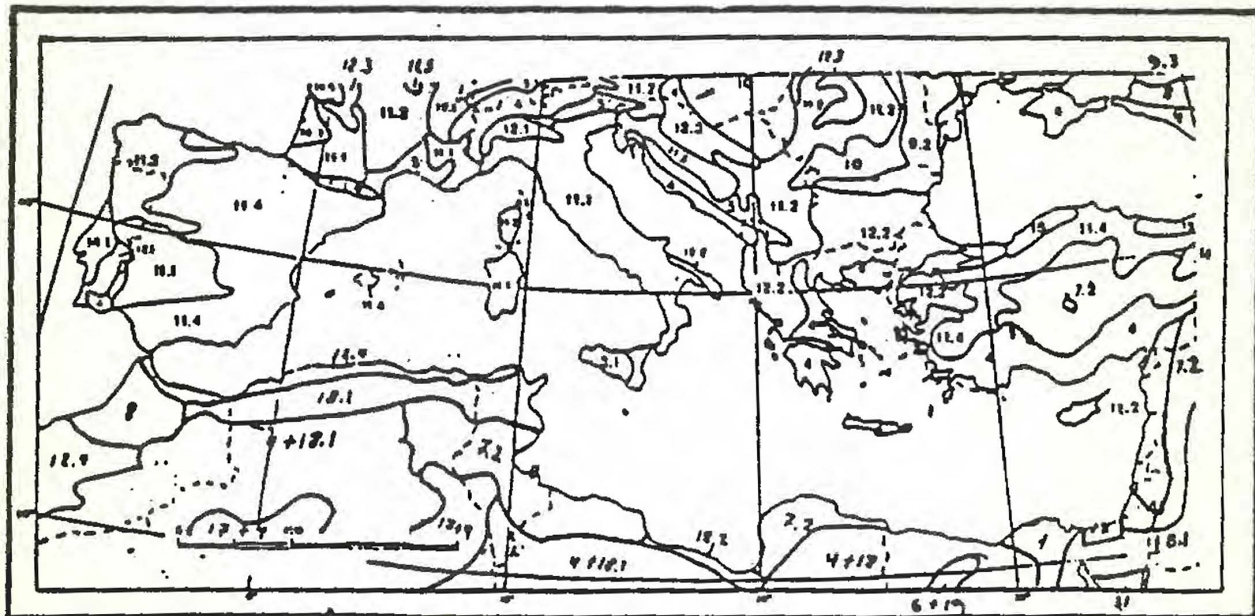


Figure 12. FINAL INFILTRATION RATE (FIR) OF CALCIC LUVISOL AS A FUNCTION OF THE SOIL ESP, WATER SALINITY, AND IMPACT ENERGY OF THE RAIN



- |                                |                        |                                    |
|--------------------------------|------------------------|------------------------------------|
| 1. Fluvisols                   | 11. Cambisols          | 14. Podzols                        |
| 2. Regosols                    | 11.1 Eutric Cambisols  | 14.1 Orthic Podzols                |
| 3.1 Eutric and Calcic Regosols | 11.2 Dystric Cambisols | 15. Acrisols                       |
| 4. Lithosols                   | 11.4 Calcic Cambisols  | 17. Dune or shifting sands complex |
| 5. Rendzinas                   | 11.5 Chromic Cambisols | 18. Yermosols                      |
| 6. Solonchaks                  | 12. Luvisols           | 18.1 Calcic Yermosols              |
| 7. Xerosols                    | 12.1 Orthic Luvisols   | 18.2 Gypsic Yermosols              |
| 7.2 Calcic Xerosols            | 12.2 Chromic Luvisols  | 19. Solonchaks                     |
| 8. Kastanozems                 | 12.3 Gleyic Luvisols   |                                    |
| 10. Phaeozems                  | 12.4 Calcic Luvisols   |                                    |

Figure 13. MAJOR SOILS REGIONS

Figure 14 : PROTECTED EAS on the Mediterranean coast, 1987

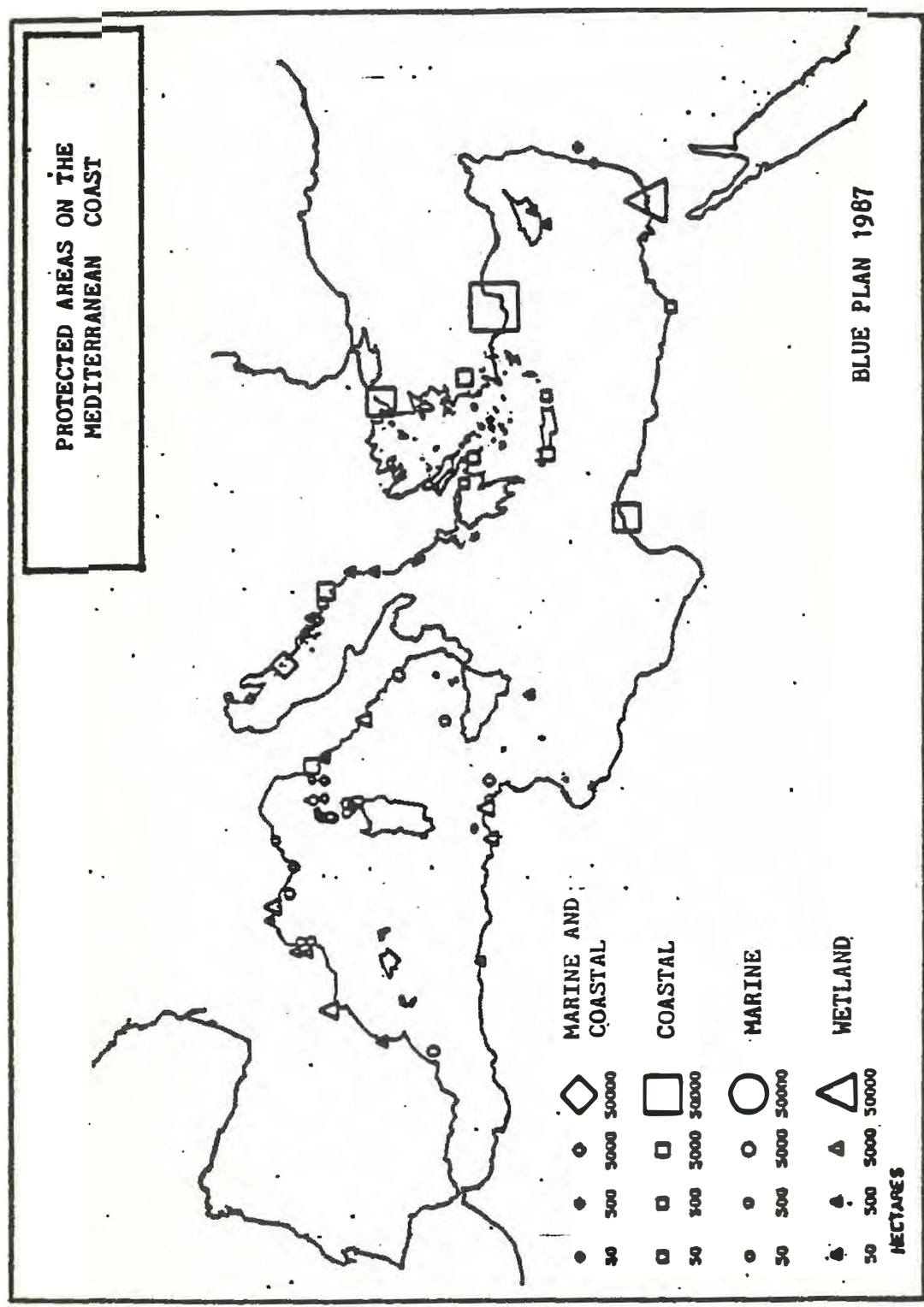


Table 1.  
REPARTITION DU PRODUIT INTERIEUR BRUT  
DISTRIBUTION OF GROSS DOMESTIC PRODUCT  
-----  
(POURCENTAGE / PERCENTAGE)

|            | AGRICULTURE |      |      |      | INDUSTRIE |      |      |      | SERVICES |      |      |      |
|------------|-------------|------|------|------|-----------|------|------|------|----------|------|------|------|
|            | 1960        | 1976 | 1980 | 1984 | 1960      | 1976 | 1980 | 1984 | 1960     | 1976 | 1980 | 1984 |
| ESPAGNE    | 21          | 9    | 8    | 6 a  | 39        | 39   | 37   | 34 a | 40       | 52   | 55   | 60 a |
| FRANCE     | 9           | 6    | 4    | 4    | 48        | 43   | 36   | 34   | 43       | 51   | 60   | 62   |
| ITALIE     | 15          | 8    | 6    | 5    | 38        | 41   | 43   | 40   | 47       | 51   | 51   | 55   |
| YUGOSLAVIE | 24          | 15   | 12   | 15   | 45        | 43   | 43   | 46   | 31       | 42   | 45   | 40   |
| GRECE      | 23          | 18   | 16   | 18   | 26        | 31   | 32   | 29   | 51       | 51   | 52   | 53   |
| TURQUIE    | 41          | 29   | 23   | 19   | 21        | 28   | 30   | 33   | 38       | 43   | 47   | 47   |
| SYRIE      | 25          | 17   | 20   | 20   | 21        | 36   | 27   | 24   | 54       | 47   | 53   | 57   |
| ISRAEL     | 11          | 8    | 5    | 5    | 32        | 43   | 36   | 27   | 57       | 49   | 59   | 68   |
| EYPT       | 30          | 29   | 23   | 20   | 24        | 30   | 35   | 33   | 46       | 41   | 42   | 48   |
| LIBYE      | 14          | 3    | 2    | 2    | 9         | 68   | 72   | 64   | 77       | 29   | 26   | 34   |
| TUNISIE    | 24          | 21   | 17   | 15   | 18        | 30   | 35   | 35   | 58       | 49   | 48   | 50   |
| ALGERIE    | 21          | 7    | 6    | 6    | 24        | 57   | 57   | 53   | 55       | 36   | 37   | 41   |
| MAROC      | 29          | 21   | 18   | 17   | 24        | 31   | 32   | 32   | 47       | 48   | 50   | 51   |

a : 1982

SOURCE : BANQUE MONDIALE, RAPPORTS SUR LE DEVELOPPEMENT DANS LE MONDE / WORLD BANK, WORLD DEVELOPMENT REPORTS

Table 2. PRODUIT NATIONAL BRUT PAR HABITANT  
GROSS NATIONAL PRODUCT PER CAPITA  
(U.S. DOLLARS)

|             | 1978  | 1979  | 1980   | 1981   | 1982   | 1983   | 1984  |            |
|-------------|-------|-------|--------|--------|--------|--------|-------|------------|
| ESPAGNE     | 3 470 | 4 380 | 5 400  | 5 640  | 5 430  | 4 780  | 4 440 | SPAIN      |
| FRANCE      | 8 260 | 9 950 | 11 730 | 12 190 | 11 680 | 10 500 | 9 760 | FRANCE     |
| ITALIE      | 3 850 | 5 250 | 6 480  | 6 960  | 6 840  | 6 400  | 6 420 | ITALY      |
| YOUgoslavie | 2 380 | 2 430 | 2 620  | 2 790  | 2 800  | 2 570  | 2 120 | YUGOSLAVIA |
| GRECE       | 3 250 | 3 960 | 4 380  | 4 420  | 4 290  | 3 920  | 3 770 | GREECE     |
| TURQUIE     | 1 200 | 1 330 | 1 470  | 1 540  | 1 370  | 1 240  | 1 160 | TURKEY     |
| SYRIE       | 930   | 1 030 | 1 340  | 1 570  | 1 680  | 1 760  | 1 620 | SYRIA      |
| ISRAEL      | 3 500 | 4 150 | 4 500  | 5 160  | 5 090  | 5 370  | 5 060 | ISRAEL     |
| EGYPTE      | 390   | 480   | 580    | 650    | 690    | 700    | 720   | EGYPT      |
| LIBYE       | 6 910 | 8 170 | 8 640  | 8 450  | 8 510  |        | 8 520 | LIBYA      |
| TUNISIE     | 950   | 1 120 | 1 310  | 1 420  | 1 390  | 1 290  | 1 270 | TUNISIA    |
| ALGERIE     | 1 260 | 1 590 | 1 870  | 2 140  | 2 350  | 2 320  | 2 410 | ALGERIA    |
| MAROC       | 670   | 740   | 900    | 860    | 870    | 760    | 670   | MOROCCO    |

SOURCE : BANQUE MONDIALE, RAPPORTS SUR LE DEVELOPPEMENT DANS LE MONDE / WORLD BANK, WORLD DEVELOPMENT REPORTS

Table 3.  
PRODUIT INTERIEUR BRUT  
GROSS DOMESTIC PRODUCT  
-----  
(MILLIONS U.S. DOLLARS)

|             | 1960   | 1979    | 1980    | 1981    | 1982    | 1983    | 1984    |            |
|-------------|--------|---------|---------|---------|---------|---------|---------|------------|
| ESPAGNE     | 11 430 | 180 800 | 198 320 | 185 080 | 181 250 | 157 880 | 160 930 | SPAIN      |
| FRANCE      | 60 060 | 571 300 | 651 890 | 568 560 | 537 260 |         | 489 380 | FRANCE     |
| ITALIE      | 37 190 | 323 600 | 393 950 | 350 220 | 344 580 | 352 840 | 348 380 | ITALY      |
| YOUgoslavie | 9 860  | 61 500  | 62 150  | 63 350  | 68 000  | 46 890  | 38 990  | YUGOSLAVIA |
| GRECE       | 3 110  | 33 370  | 35 650  | 33 390  | 33 950  | 30 770  | 29 550  | GREECE     |
| TURQUIE     | 8 820  | 56 460  | 53 820  | 53 910  | 49 980  | 47 840  | 47 460  | TURKEY     |
| SYRIE       | 890    | 9 110   | 12 900  | 15 240  | 15 240  | 16 850  | 15 930  | SYRIA      |
| ISRAEL      | 2 030  | 15 300  | 15 340  | 17 440  | 20 490  | 20 660  | 22 350  | ISRAEL     |
| EGYPTE      | 3 880  | 17 050  | 22 970  | 23 110  | 26 400  | 27 920  | 30 060  | EGYPT      |
| LIBYE       | 310    | 24 570  | 32 090  | 27 400  | 28 360  | 31 360  | 30 570  | LIBYA      |
| TUNISIE     | 770    | 6 070   | 7 300   | 7 100   | 7 090   | 7 020   | 6 940   | TUNISIA    |
| ALGERIE     | 2 740  | 29 810  | 39 870  | 41 830  | 44 930  | 47 200  | 50 690  | ALGERIA    |
| MAROC       | 2 040  | 14 950  | 17 940  | 14 780  | 14 700  | 13 300  | 13 300  | MOROCCO    |

SOURCE : BANQUE MONDIALE, RAPPORTS SUR LE DEVELOPPEMENT DANS LE MONDE / WORLD BANK, WORLD DEVELOPMENT REPORTS

Table 4. GROSS DOMESTIC PRODUCT IN 2000

| PAYS       | 1980  |       | 1983 <sup>a</sup> |       | T-1<br>2000/85 |         | T-2<br>2000/85 |         | T-3<br>2000/85 |         | A-1<br>2000/85 |         | A-2<br>2000/85 |         |
|------------|-------|-------|-------------------|-------|----------------|---------|----------------|---------|----------------|---------|----------------|---------|----------------|---------|
|            | PIB   | 80/80 | PIB               | 83/80 | PIB            | 2000/85 | PIB            | 2000/85 | PIB            | 2000/85 | PIB            | 2000/85 | PIB            | 2000/85 |
| ESPAGNE    | 110,2 | 6,7   | 119,39            | 1,4   | 199            | 2,1     | 180,6          | 8,8     | 217,2          | 6,1     | 222,25         | 0,2     | 222,25         | 6,1     |
| FRANCE     | 398,8 | 4,6   | 421,32            | 1,1   | 640,8          | 2,8     | 622,3          | 2,6     | 696,9          | 1,6     | 709,2          | 1,8     | 709,2          | 2,1     |
| ITALIE     | 250,2 | 6,1   | 240,02            | 0,8   | 342,1          | 1,4     | 332,1          | 2,1     | 344,2          | 2,8     | 387,6          | 3,2     | 387,6          | 2,2     |
| YOUOSLAVIE | 37,28 | 5,8   | 38,22             | 0,6   | 59,67          | 2,8     | 54,83          | 2,7     | 63,64          | 2,1     | 68,63          | 4,0     | 68,63          | 4,0     |
| GRÈCE      | 22,94 | 6,3   | 23,77             | 0,7   | 42,41          | 1,8     | 38,18          | 2,2     | 45,82          | 6,6     | 49,02          | 6,8     | 49,02          | 6,8     |
| TURQUIE    | 41,76 | 5,5   | 53,03             | 4,9   | 82,3           | 2,5     | 73,34          | 2,2     | 82,61          | 2,0     | 90,45          | 2,6     | 90,45          | 2,6     |
| FINLE      | 7,38  | 7,7   | 8,46              | 2,7   | 12,37          | 2,7     | 12,09          | 2,6     | 13,39          | 1,2     | 14,07          | 1,0     | 14,38          | 1,8     |
| LITUA      | 2,42  | 1,6   | 2,42              | 0,0   | 4,02           | 1,4     | 4,02           | 1,4     | 4,02           | 1,4     | 4,02           | 1,4     | 4,02           | 1,4     |
| ISRAËL     | 13,06 | 6,8   | 13,06             | 0,0   | 27,1           | 4,0     | 27,1           | 1,0     | 28,62          | 1,4     | 30,8           | 1,8     | 30,8           | 1,8     |
| EGYPTE     | 20,31 | 6,60  | 26,68             | 5,6   | 36,82          | 2,1     | 35,63          | 2,8     | 40,1           | 2,7     | 44,25          | 2,0     | 49,43          | 4,2     |
| LIBYE      | 18,37 | 17,8  | 12,32             | -7,7  | 28,93          | 4,8     | 27,84          | 4,6     | 32,59          | 10,2    | 36,84          | 10,7    | 36,84          | 10,7    |
| THAÏLANDE  | 5,04  | 6,4   | 6,18              | 6,2   | 9,01           | 2,5     | 8,67           | 2,2     | 9,93           | 2,2     | 11,38          | 6,2     | 12,89          | 6,7     |
| ALGERIE    | 13,87 | 1,7   | 15,94             | 2,8   | 22,82          | 2,4     | 20,61          | 1,7     | 24,76          | 2,0     | 27,60          | 1,7     | 34,80          | 1,7     |
| MAROC      | 12,97 | 6,8   | 14,79             | 2,6   | 22,75          | 2,8     | 20,34          | 2,1     | 24,3           | 2,5     | 25,84          | 2,6     | 26,77          | 6,3     |

<sup>a</sup> estimation provisoire pour 1985

Tableau 13. PIB EN 2000 (EN MILLIARDS DE US DOLLARS 1975) ET TAUX DE CROISSANCE POUR LA PÉRIODE 1985-2000 (EN %)

Table 5. GROSS DOMESTIC PRODUCT IN 2025

|             | T-1   |           | T-2   |           | T-3   |           | A-1   |           | A-2    |           |
|-------------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|--------|-----------|
|             | F1B   | 2025/2000 | F1B   | 2025/2000 | F1B   | 2025/2000 | F1B   | 2025/2000 | F1B    | 2025/2000 |
| ESPAGNE     | 500.7 | 3.6       | 414.6 | 3.6       | 398.8 | 6.3       | 631.8 | 6.3       | 613    | 6.3       |
| FRANCE      | 1464  | 5.6       | 1422  | 3.6       | 1728  | 3.7       | 1809  | 3.8       | 1760   | 3.7       |
| ITALIE      | 798.8 | 5.6       | 775.4 | 3.6       | 925.3 | 3.8       | 1014  | 3.8       | 983.8  | 3.8       |
| YOUKOSLAVIE | 133.8 | 3.8       | 146.5 | 3.8       | 179.7 | 6.8       | 220.1 | 6.8       | 213.4  | 6.8       |
| GRECE       | 114.2 | 6.0       | 93.23 | 3.8       | 134.1 | 6.6       | 150.3 | 6.6       | 143.5  | 6.6       |
| TURQUIE     | 215.2 | 3.8       | 161.6 | 3.8       | 237.8 | 6.3       | 294.9 | 6.8       | 311.8  | 6.1       |
| SYRIE       | 35.02 | 6.3       | 33.68 | 6.3       | 42.86 | 6.7       | 49.02 | 6.3       | 60.23  | 6.8       |
| LIBAN       | 12.18 | 6.6       | 12.18 | 6.6       | 13.58 | 6.8       | 14.08 | 6.3       | 17.33  | 6.8       |
| ISRAEL      | 70.42 | 3.8       | 64.1  | 3.6       | 78.15 | 6.3       | 112.8 | 6.3       | 133.5  | 6.3       |
| EGYPTE      | 91.04 | 3.7       | 88.1  | 3.7       | 107.8 | 6.8       | 125   | 6.6       | 180.5  | 6.3       |
| LIBYE       | 69.4  | 3.8       | 57.37 | 3.8       | 203.4 | 6.8       | 215   | 6.1       | 215    | 6.6       |
| TUNISIE     | 25.51 | 6.8       | 23.14 | 6.0       | 28.02 | 6.6       | 37.93 | 6.8       | 55.19  | 6.6       |
| ALGERIE     | 58.49 | 3.8       | 49.9  | 3.6       | 70.64 | 6.3       | 82.90 | 6.6       | 101.36 | 6.3       |
| MAROC       | 58.43 | 3.8       | 48.05 | 3.6       | 69.8  | 6.6       | 85.46 | 6.8       | 105.3  | 6.8       |

Tableau 17. PIB EN 2025 (EN MILLIARDS DE US DOLLARS 1975) ET TAUX DE CROISSANCE POUR LA PERIODE 1900-2025 (EN %) (EN 23)

| Country                             | Population<br>1980 | SCENARIO<br>T1 |         |         | SCENARIO<br>T2 |         |         | SCENARIO<br>T3 |         |         | SCENARIO<br>A1 |         |         | SCENARIO<br>A2 |         |         |
|-------------------------------------|--------------------|----------------|---------|---------|----------------|---------|---------|----------------|---------|---------|----------------|---------|---------|----------------|---------|---------|
|                                     |                    | 1985           | 2000    | 2025    | 1985           | 2000    | 2025    | 1985           | 2000    | 2025    | 1985           | 2000    | 2025    | 1985           | 2000    | 2025    |
| SPAIN                               | 37.400             | 38.500         | 41.900  | 44.900  | 38.500         | 41.900  | 44.900  | 38.500         | 42.200  | 46.000  | 38.500         | 42.200  | 46.000  | 38.500         | 43.900  | 51.800  |
| FRANCE                              | 53.700             | 54.600         | 55.200  | 57.600  | 54.600         | 55.200  | 57.600  | 54.600         | 57.200  | 58.400  | 54.600         | 57.200  | 58.400  | 54.600         | 58.300  | 63.500  |
| ITALY                               | 57.100             | 57.300         | 57.800  | 53.600  | 57.300         | 57.800  | 53.600  | 57.300         | 58.600  | 57.200  | 57.300         | 58.600  | 57.200  | 57.300         | 60.500  | 63.300  |
| GREECE                              | 9.640              | 9.880          | 10.100  | 9.560   | 9.880          | 10.100  | 9.560   | 9.880          | 10.400  | 10.800  | 9.820          | 10.400  | 10.800  | 9.880          | 10.800  | 12.100  |
| YUGOSLAVIA                          | 22.300             | 23.200         | 24.700  | 25.000  | 23.200         | 24.700  | 25.000  | 23.200         | 25.200  | 26.800  | 23.200         | 25.200  | 26.800  | 23.200         | 25.800  | 29.000  |
| TOTAL<br>REGION A*                  | 180.000            | 183.000        | 190.000 | 186.000 | 183.000        | 190.000 | 186.000 | 183.000        | 194.000 | 199.000 | 183.000        | 194.000 | 199.000 | 183.000        | 199.000 | 220.000 |
| MOROCCO                             | 26                 | 27             | 30      | 36      | 27             | 30      | 36      | 27             | 30      | 36      | 27             | 30      | 36      | 27             | 30      | 36      |
| MALTA                               | 369                | 383            | 418     | 459     | 383            | 418     | 459     | 383            | 418     | 459     | 383            | 418     | 459     | 383            | 418     | 459     |
| ALBANIA                             | 2.730              | 3.030          | 4.100   | 5.780   | 3.030          | 4.100   | 5.780   | 3.030          | 4.100   | 5.780   | 3.030          | 4.100   | 5.780   | 3.030          | 4.260   | 6.500   |
| CYPRUS                              | 629                | 669            | 762     | 902     | 669            | 762     | 902     | 669            | 762     | 902     | 669            | 762     | 902     | 669            | 762     | 902     |
| LEBANON                             | 2.670              | 2.670          | 3.620   | 5.220   | 2.670          | 3.620   | 5.220   | 2.670          | 3.620   | 5.220   | 2.670          | 3.620   | 5.220   | 2.670          | 3.830   | 5.950   |
| ISRAEL                              | 3.880              | 4.250          | 5.300   | 6.870   | 4.250          | 5.300   | 6.870   | 4.250          | 5.300   | 6.870   | 4.250          | 5.300   | 6.870   | 4.250          | 5.720   | 8.120   |
| TOTAL<br>REGION C*                  | 10.300             | 11.000         | 14.200  | 19.300  | 11.000         | 14.200  | 19.300  | 11.000         | 14.200  | 19.300  | 11.000         | 14.200  | 19.300  | 11.000         | 15.000  | 22.000  |
| TURKEY                              | 44.500             | 49.300         | 65.400  | 91.900  | 49.300         | 68.600  | 103.000 | 49.300         | 65.400  | 91.900  | 49.300         | 65.400  | 91.900  | 49.300         | 62.300  | 81.700  |
| SYRIA                               | 8.800              | 10.500         | 17.000  | 31.800  | 10.500         | 18.300  | 35.500  | 10.500         | 17.000  | 31.800  | 10.500         | 17.000  | 31.800  | 10.500         | 17.000  | 28.100  |
| EGYPT                               | 41.500             | 46.900         | 63.900  | 90.400  | 47.100         | 65.700  | 97.300  | 46.900         | 63.900  | 90.400  | 46.900         | 63.900  | 90.400  | 46.900         | 62.200  | 83.000  |
| LIBYA                               | 2.970              | 3.610          | 6.080   | 11.100  | 3.620          | 6.240   | 12.500  | 3.610          | 6.080   | 11.100  | 3.600          | 5.920   | 9.910   | 3.600          | 5.920   | 9.910   |
| TUNISIA                             | 6.390              | 7.080          | 9.430   | 12.900  | 7.130          | 9.830   | 14.000  | 7.080          | 9.430   | 12.900  | 7.030          | 9.040   | 12.100  | 7.030          | 9.060   | 12.100  |
| ALGERIA                             | 18.700             | 21.700         | 33.400  | 50.600  | 21.800         | 34.700  | 56.500  | 21.600         | 33.400  | 50.600  | 21.600         | 32.200  | 46.500  | 21.600         | 32.200  | 46.400  |
| MOROCCO                             | 19.400             | 21.900         | 29.500  | 40.100  | 22.200         | 31.400  | 43.000  | 21.900         | 29.500  | 40.100  | 21.900         | 28.900  | 39.100  | 21.900         | 28.900  | 39.100  |
| TOTAL<br>REGION B*                  | 142.000            | 161.000        | 226.000 | 329.000 | 162.000        | 235.000 | 366.000 | 160.000        | 226.000 | 329.000 | 160.000        | 218.000 | 307.000 | 160.000        | 218.000 | 307.000 |
| Total<br>Mediterranean<br>countries | 333.000            | 356.000        | 430.000 | 533.000 | 356.000        | 439.000 | 571.000 | 355.000        | 433.000 | 547.000 | 355.000        | 426.000 | 521.000 | 355.000        | 432.000 | 544.000 |

\* Addition based on non-rounded figures (3 significant figures).

Table 7. MEDITERRANEAN COASTLINE

|              | Mediterranean Coastline |                           |                |                   | Number of adminis-<br>trative units | Mediterranean Coastal Regions       |          |                                     |
|--------------|-------------------------|---------------------------|----------------|-------------------|-------------------------------------|-------------------------------------|----------|-------------------------------------|
|              | Total<br>in km          | Included<br>islands in km | % Rocky Coasts | % Tectonic Coasts |                                     | Total Population<br>in 1000s (1983) | 1/nation | Urban population<br>in 1000s (1983) |
| SPAIN        | 3,300                   | 910(1)                    | 32             | 1,238             | 2 Provinces                         | 13,840                              | 36       | 11,177                              |
| FRANCE       | 1,703                   | 802(2)                    | 64             | 613               | Departments                         | 3,494                               | 1,01     | 4,818                               |
| YUGOSLAVIA   | 4                       |                           | 73             | 1                 | 5 Regions                           | 27                                  | 73,8     | 27                                  |
| IT.          | 7,933                   | 3,766(3)                  | 40             | 4,771             | Total country                       | 41,829                              | 100      | 27,923                              |
| MALTA        | 137                     |                           | 30             | 68                | Total country                       | 383                                 | 100      | 327                                 |
| TURKIELASTIA | 1,116                   | 4,026                     | 88             | 1,223             | 3 Communes<br>Communes Admin. 1     | 2,382                               | 11,2     | 1,040                               |
| ALBANIA      | 418                     |                           | 34             | 273               | Total country                       | 3,030                               | 100      | 1,040                               |
| GREECE       | 13,000                  | 7,700                     | 70             | 4,300             | 1 Same and<br>Greater Athens        | 8,342                               | 89,7     | 3,261                               |
| TURKEY       | 3,191                   | 809                       | 70             | 1,357             | 6 Provinces                         | 18,000                              | 20,3     | 3,300                               |
| SYRIA        | 782                     |                           | 15             | 352               | Total country                       | 649                                 | 100      | 331                                 |
| LIBYA        | 183                     |                           | 3              | 176               | 2 Subprefectures                    | 1,133                               | 11       | 413                                 |
| EGYPT        | 223                     |                           | 30             | 112               | Total country                       | 1,648                               | 100      | 2,140                               |
| ISRAEL       | 190                     |                           | 3              | 180               | 1 Subprefecture                     | 2,846                               | 67,9     | 3,840                               |
| LEBANON      | 930                     |                           | 0              | 930               | 6 Governorates                      | 16,311                              | 35,2     | 3,900                               |
| IRAQ         | 1,770                   |                           | 10             | 1,393             | 3 Salodysts                         | 2,284                               | 63,4     | 1,430                               |
| SYRIA        | 1,300                   |                           | 3              | 1,233             | 3 Governorates                      | 4,943                               | 70,1     | 3,330                               |
| CHINA        | 1,200                   |                           | 80             | 240               | 3 Vilayas                           | 11,300                              | 33,8     | 3,320                               |
| EGYPT        | 312                     |                           | 30             | 336               | 6 Provinces                         | 3,390                               | 13,5     | 1,313                               |
|              | 40,214                  | 18,011                    | 38             | 19,340            |                                     | 132,115                             | 372      | ...                                 |

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Table 8 . . . POPULATION in the Mediterranean regions, 1985

|            | COUNTRY                |                                 | MEDITERRANEAN REGIONS  |                                 | SHARE OF MEDITERRANEAN REGIONS |                  | NUMBER OF COASTAL ADMINISTRATIVE AREAS |
|------------|------------------------|---------------------------------|------------------------|---------------------------------|--------------------------------|------------------|----------------------------------------|
|            | POPULATION (thousands) | SURFACE AREA (km <sup>2</sup> ) | POPULATION (thousands) | SURFACE AREA (km <sup>2</sup> ) | POPULATION (%)                 | SURFACE AREA (%) |                                        |
| SPAIN      | 38 542                 | 504 782                         | 14 410                 | 25 504                          | 37.4                           | 5.1              | 12 PROVINCES                           |
| FRANCE     | 54 621                 | 547 026                         | 5 496                  | 46 248                          | 10.1                           | 8.5              | 9 DEPARTMENTS                          |
| ITALY      | 57 300                 | 301 225                         | 42 069                 | 226 685                         | 73.6                           | 75.3             | 15 REGIONS                             |
| MALTA      | 383                    | 316                             | 383                    | 316                             | 100.0                          | 100.0            | COUNTRY TOTAL                          |
| YUGOSLAVIA | 23 153                 | 255 804                         | 2 492                  | 42 440                          | 10.8                           | 16.6             | 33 COUNTIES + 3 ASSOC. COMM.           |
| ALBANIA    | 3 050                  | 28 748                          | ?                      | ?                               | ?                              | ?                | UNDEFINED                              |
| GREECE     | 9 878                  | 131 944                         | 9 117                  | 100 278                         | 92.3                           | 76.0             | 41 NOMES + GREATER ATHENS              |
| TURKEY     | 49 289                 | 780 576                         | 9 998                  | 122 612                         | 20.3                           | 15.7             | 10 PROVINCES                           |
| CYPRUS     | 669                    | 9 251                           | 669                    | 9 251                           | 100.0                          | 100.0            | COUNTRY TOTAL                          |
| SYRIA      | 10 505                 | 185 180                         | 1 140                  | 4 200                           | 10.9                           | 2.3              | 2 MOHAFAZATS                           |
| LEBANON    | 2 668                  | 10 400                          | 2 668                  | 2 668                           | 100.0                          | 100.0            | COUNTRY TOTAL                          |
| ISRAEL     | 6 252                  | 20 770                          | 2 886                  | 4 474                           | 67.9                           | 21.5             | 9 SUBDISTRICTS                         |
| EGYPT      | 46 909                 | 1 001 449                       | 15 957                 | 403 716                         | 34.0                           | 40.3             | 10 GOVERNORATES                        |
| LIBYA      | 3 605                  | 1 759 540                       | ?                      | ?                               | ?                              | ?                | UNDEFINED                              |
| TUNISIA    | 7 081                  | 163 610                         | 4 998                  | 45 712                          | 70.6                           | 27.9             | 13 GOVERNORATES                        |
| ALGERIA    | 21 718                 | 2 381 741                       | 11 902                 | 68 294                          | 54.8                           | 2.9              | 13 WILAYAS                             |
| MOROCCO    | 21 941                 | 446 550                         | 3 384                  | 41 950                          | 15.4                           | 9.4              | 6 PROVINCES                            |

Source : Blue Plan, 1986

Table 9 URBANIZED COASTAL AREA

Les Espaces Populés du P.M. B.C.

SURFACE URBANISÉE LITTORALE DANS LES CINQ RÉGIONS MÉDITERRANÉENNES  
(km²)

|              | 1988  | T1<br>2000 | T1<br>2025 | T2<br>2000 | T2<br>2025 | T3<br>2000 | T3<br>2025 | A1<br>2000 | A1<br>2025 | A2<br>2000 | A2<br>2025 |
|--------------|-------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| ESPAGNE      | 2798  | 3873       | 4193       | 3358       | 4421       | 3421       | 4069       | 3421       | 4069       | 3526       | 4400       |
| FRANCE       | 1288  | 1354       | 1402       | 1354       | 1367       | 1391       | 1579       | 1391       | 1579       | 1443       | 1738       |
| ITALIE       | 6981  | 7463       | 7637       | 7387       | 7807       | 7537       | 7822       | 7537       | 7822       | 7714       | 8033       |
| GRÈCE        | 1313  | 1649       | 1848       | 1542       | 1873       | 1675       | 2052       | 1675       | 2052       | 1735       | 2200       |
| TURQUIE      | 351   | 517        | 762        | 616        | 890        | 364        | 973        | 364        | 973        | 560        | 926        |
| RÉGION A     | 12844 | 14457      | 15311      | 14406      | 16238      | 14639      | 16475      | 14639      | 16475      | 14966      | 17725      |
| PORTUGAL     | 2     | 2          | 2          | 2          | 2          | 2          | 2          | 2          | 2          | 2          | 2          |
| ALBIE        | 13    | 18         | 17         | 13         | 17         | 13         | 17         | 13         | 17         | 13         | 17         |
| ALBANIE      | 30    | 42         | 40         | 30         | 40         | 30         | 40         | 30         | 40         | 30         | 40         |
| CHYPRE       | 20    | 27         | 40         | 27         | 40         | 27         | 40         | 27         | 40         | 27         | 40         |
| LIBAN        | 86    | 127        | 192        | 127        | 192        | 127        | 192        | 127        | 192        | 135        | 218        |
| ISRAËL       | 154   | 198        | 262        | 198        | 262        | 198        | 262        | 198        | 262        | 214        | 310        |
| RÉGION C     | 326   | 481        | 681        | 481        | 710        | 481        | 681        | 481        | 681        | 478        | 777        |
| TUNISIE      | 371   | 366        | 1110       | 635        | 1337       | 367        | 1034       | 317        | 910        | 486        | 785        |
| SYRIE        | 17    | 33         | 94         | 39         | 118        | 13         | 82         | 31         | 74         | 85         | 261        |
| ÉGYPTE       | 236   | 416        | 784        | 448        | 878        | 448        | 721        | 371        | 624        | 389        | 686        |
| LIBYE        | 88    | 143        | 426        | 186        | 521        | 186        | 374        | 177        | 346        | 174        | 380        |
| PALESTINE    | 148   | 231        | 374        | 274        | 431        | 274        | 374        | 177        | 377        | 174        | 380        |
| ALGÈRE       | 276   | 320        | 885        | 339        | 1108       | 467        | 915        | 467        | 711        | 389        | 319        |
| MAROC        | 91    | 149        | 268        | 164        | 313        | 149        | 268        | 149        | 268        | 141        | 264        |
| RÉGION D     | 1243  | 2078       | 3788       | 2238       | 4498       | 2012       | 3656       | 1908       | 3796       | 1827       | 3567       |
| MAGREB       |       |            |            |            |            |            |            |            |            |            |            |
| MÉDITERRANÉE | 14213 | 17026      | 20481      | 17388      | 21766      | 17092      | 20813      | 16948      | 20480      | 17270      | 21799      |

Table 11. POPULATION IN THE COASTAL ZONES PER KM OF COASTAL LINE

POPULATION LITTORALE PAR KILOMÈTRE DE CÔTE DES CINQ RÉGIONS MÉDITERRANÉENNES  
(Habitants/km)

|              | 1988  | T1<br>2000 | T1<br>2025 | T2<br>2000 | T2<br>2025 | T3<br>2000 | T3<br>2025 | A1<br>2000 | A1<br>2025 | A2<br>2000 | A2<br>2025 | LONGUEUR DES CÔTES<br>(km) |       |
|--------------|-------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----------------------------|-------|
|              |       |            |            |            |            |            |            |            |            |            |            | TOTAL                      | ILES  |
| ESPAGNE      | 5372  | 6171       | 7132       | 6379       | 7133       | 6130       | 6933       | 6130       | 6933       | 6378       | 7134       | 2580                       | 918   |
| FRANCE       | 3277  | 3614       | 3638       | 3374       | 3490       | 3796       | 4184       | 3796       | 4184       | 3937       | 4461       | 1783                       | 882   |
| ITALIE       | 5260  | 5369       | 6779       | 5369       | 6779       | 5382       | 5254       | 5382       | 5254       | 5333       | 5812       | 7933                       | 3786  |
| GRÈCE        | 391   | 602        | 578        | 486        | 588        | 617        | 634        | 617        | 634        | 641        | 716        | 15088                      | 7700  |
| TURQUIE      | 422   | 585        | 647        | 576        | 728        | 577        | 816        | 577        | 816        | 591        | 883        | 6116                       | 6834  |
| RÉGION A     | 2178  | 2291       | 2299       | 2382       | 2580       | 2336       | 2639       | 2336       | 2639       | 2417       | 2713       | 33352                      | 17282 |
| PORTUGAL     | 6750  | 7500       | 9000       | 7500       | 9000       | 7500       | 9000       | 7500       | 9000       | 7500       | 9000       | 4                          |       |
| ALBIE        | 2128  | 2322       | 2350       | 2322       | 2350       | 2322       | 2350       | 2322       | 2350       | 2322       | 2350       | 180                        |       |
| ALBANIE      | 7277  | 9809       | 13828      | 9809       | 13828      | 9809       | 13828      | 9809       | 13828      | 10191      | 13558      | 618                        |       |
| CHYPRE       | 853   | 974        | 1153       | 974        | 1153       | 974        | 1153       | 974        | 1153       | 974        | 1153       | 782                        |       |
| LIBAN        | 11867 | 16089      | 23288      | 16089      | 23288      | 16089      | 23288      | 16089      | 23288      | 17822      | 26444      | 273                        |       |
| ISRAËL       | 21258 | 26580      | 34358      | 26580      | 34358      | 26580      | 34358      | 26580      | 34358      | 28660      | 60686      | 288                        |       |
| RÉGION C     | 6188  | 7866       | 10631      | 7866       | 10631      | 7866       | 10631      | 7866       | 10631      | 8383       | 12163      | 1889                       | 8     |
| TUNISIE      | 1926  | 2639       | 4073       | 2987       | 4672       | 2647       | 3899       | 2584       | 3458       | 2389       | 3801       | 5191                       | 889   |
| SYRIE        | 6311  | 11672      | 24275      | 12497      | 29498      | 11672      | 22519      | 10929      | 20219      | 10219      | 18361      | 183                        |       |
| ÉGYPTE       | 17388 | 25812      | 34257      | 24897      | 37895      | 23542      | 33368      | 22916      | 30421      | 22916      | 31316      | 950                        |       |
| LIBYE        | 1278  | 2387       | 5056       | 2426       | 5743       | 2331       | 4982       | 2319       | 4976       | 2286       | 4746       | 1770                       |       |
| PALESTINE    | 3819  | 5158       | 7172       | 5443       | 7772       | 5077       | 6725       | 4723       | 6333       | 4808       | 6142       | 1308                       |       |
| ALGÈRE       | 9583  | 13932      | 19676      | 12637      | 23887      | 12637      | 19481      | 12583      | 17888      | 11369      | 16468      | 1280                       |       |
| MAROC        | 6621  | 8631       | 11641      | 9363       | 12779      | 8574       | 11660      | 8669       | 11323      | 8363       | 11426      | 912                        |       |
| RÉGION D     | 4485  | 6349       | 9337       | 6774       | 10829      | 6281       | 9768       | 6087       | 9416       | 5888       | 7891       | 11186                      | 889   |
| MAGREB       |       |            |            |            |            |            |            |            |            |            |            |                            |       |
| MÉDITERRANÉE | 2885  | 3483       | 4356       | 3393       | 4681       | 3499       | 4399       | 3433       | 4193       | 3441       | 4325       | 44267                      | 18811 |

LAND USE, in the Mediterranean regions and countries, according to national statistical yearbooks (1980s) (in 1000 ha)

|                                | Utilized Agricultural Land |                                       |                                            |                      |                     |                    | OTHER LAND                     |                               |              |                             |             |                   |
|--------------------------------|----------------------------|---------------------------------------|--------------------------------------------|----------------------|---------------------|--------------------|--------------------------------|-------------------------------|--------------|-----------------------------|-------------|-------------------|
|                                | Total area (U.A.L.)        | Arable land                           |                                            |                      | Permanent meadows   | Range land         | Non-utilized agricultural land | Forests and other wooded land | Water areas  | Other non-agricultural land |             | TOTAL AREA        |
|                                |                            | Temporary crops and meadows + fallows | Gardens (trees, vineyards, market gardens) | Total arable land    |                     |                    |                                |                               |              | Unproductive land           | Built areas |                   |
| SPAIN 1984<br>Med. region      | 39 898.1<br>6 881.6        | 10 847.2<br>1 445.2                   | 4 916.3<br>1 767.4                         | 20 507.7<br>3 981.4  | 19 390.4<br>2 900.2 | 7 233.1<br>1 868.6 | 3 343.8<br>800.2               | 11 792.0<br>1 974.8           |              |                             |             | 50.475<br>9.550   |
| FRANCE 1982<br>Med region 1984 | 31 649<br>1 711            | 17 350<br>346                         | 1 677<br>580                               | 19 027<br>924        | 12 622<br>787       | -                  | 2 747<br>827                   | 14 369.0<br>1 421             | 124<br>85    | 5809<br>694                 |             | 54.703<br>4.688   |
| ITALY 1982<br>Med. region      | 17 252.1<br>13 786.8       | 9 050.5<br>7 220.0                    | 3 209.9<br>2 936.7                         | 12 260.4<br>10 156.7 | 4 991.7<br>3 630.2  | 2 775.7<br>2 025.0 | 3 706.5<br>2 476.7             | 6.393.4<br>4 382.0            |              |                             |             | 30.122<br>22.668  |
| YUGOSLAVIA 1982<br>Med. region | 10 019<br>3 241            | 7 218.0<br>1 981.0                    | 625.0<br>263.0                             | 7 843<br>2 224       | 2 176.0<br>1 017.0  | 4 349.0<br>2 202.0 | 2 488.0<br>1 324.0             | 8 746.0<br>4 450.0            |              |                             |             | 25.602<br>11.115  |
| ALBANIA                        |                            |                                       |                                            |                      |                     |                    |                                |                               |              |                             |             | 2.875             |
| GREECE                         |                            |                                       |                                            |                      |                     |                    |                                |                               |              |                             |             | 13.195            |
| TURKEY 1983?<br>Med. reg.      | 47 751<br>9 642            | 35 590<br>7 112                       | 1 063<br>448                               | 26.653<br>7 560      | 21 098<br>2 082     | 643.0<br>34        | 1 042.0<br>555.0               | 23 478.0<br>10 562.0          | 1.102<br>250 | 3 208 (1)<br>1 030          | 560<br>216  | 77.784<br>22.294  |
| CYPRUS                         |                            |                                       |                                            |                      |                     |                    |                                |                               |              |                             |             | 925               |
| SYRIA<br>Med. region           | 5 655<br>215               | 5 655<br>215                          | ..                                         | 5 655<br>215         | -                   | 8 317<br>4         | 514<br>18                      | 498.0<br>218.0                | 113<br>3     | 3 040<br>40                 | 381<br>26   | 18.518<br>420     |
| LEBANON<br>Med. region         |                            |                                       |                                            |                      |                     |                    |                                |                               |              |                             |             | 1.040<br>287      |
| ISRAEL<br>Med. region          |                            |                                       |                                            |                      |                     |                    | 205                            | 110                           |              |                             |             | 2.077<br>472      |
| EGYPT 1980<br>Med. region      |                            | 2 992                                 |                                            |                      |                     |                    |                                |                               |              |                             |             | 100.145<br>60.372 |
| LIBYA<br>Med. region           |                            |                                       |                                            |                      |                     |                    |                                |                               |              |                             |             | 175.954<br>..     |
| TUNISIA 1984<br>Med. region    | 3 677<br>1 968             | 2 101<br>1 002 (2)                    | 1 576<br>966 (2)                           | 3 677<br>1 968       | -                   | 3 358<br>1 627 (2) | 3 260<br>545                   | 4 505<br>965                  |              |                             |             | 16.361<br>4.571   |
| ALGERIA 1984<br>Med. region    | 7 510<br>2.740             | 6.868<br>2 279                        | 625<br>452                                 | 7 493<br>2 731       | 17<br>8             | 31 661<br>700      | 346<br>174                     |                               |              |                             |             | 238.174<br>6.828  |
| MOROCCO 1984<br>Med. region    | 8 353<br>880               | 7 834<br>816                          | 519<br>64                                  | 8 359<br>880         | -                   | 28 269<br>1 696    | -                              | 7 852.8<br>1 591.4            | ..           | -                           | 180<br>28   | 44.655<br>4.196   |
| TOTAL MED.                     |                            |                                       |                                            |                      |                     |                    |                                |                               |              |                             |             |                   |

(1) Salty soil, river beds, coastal dunes, rocky soil

(2) Including the Governorate of Tetouane; in Tunisia, ranges include fallow

Source: Blue Plan

Table 12. PERCENTAGE OF URBANIZATION IN THE COASTAL ZONES

Les Statistiques Population du PLAN BLEU

## Taux d'urbanisation du littoral des cinq pays méditerranéens

|                        | 1960   | T1<br>2000 | T1<br>2025 | T2<br>2000 | T2<br>2025 | T3<br>2000 | T3<br>2025 | A1<br>2000 | A1<br>2025 | A2<br>2000 | A2<br>2025 |
|------------------------|--------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| ESPAGNE                | 83.64  | 87.29      | 91.14      | 87.84      | 90.07      | 88.24      | 90.73      | 88.24      | 90.73      | 84.96      | 88.11      |
| FRANCE                 | 87.32  | 87.99      | 93.00      | 90.78      | 91.99      | 88.08      | 88.62      | 88.08      | 88.62      | 88.10      | 88.61      |
| ITALIE                 | 66.76  | 70.70      | 77.63      | 71.88      | 79.66      | 70.44      | 73.16      | 70.44      | 73.16      | 69.88      | 74.02      |
| GRECE                  | 59.37  | 73.08      | 86.47      | 67.84      | 86.09      | 73.36      | 86.37      | 73.36      | 86.37      | 72.19      | 84.16      |
| ALBANIE                | 54.38  | 67.00      | 76.99      | 70.00      | 80.00      | 64.01      | 73.99      | 64.01      | 73.99      | 62.90      | 69.31      |
| REGION A               | 69.63  | 75.68      | 82.85      | 78.10      | 85.30      | 73.00      | 81.01      | 73.00      | 81.01      | 74.36      | 79.37      |
| PORTUGAL               | 100.00 | 100.00     | 100.00     | 100.00     | 100.00     | 100.00     | 100.00     | 100.00     | 100.00     | 100.00     | 100.00     |
| MARTE                  | 85.38  | 89.23      | 92.37      | 89.23      | 92.37      | 89.23      | 92.37      | 89.23      | 92.37      | 89.23      | 92.37      |
| ARMENIE                | 34.10  | 46.00      | 58.30      | 44.59      | 67.13      | 40.00      | 58.30      | 40.00      | 58.30      | 39.91      | 58.31      |
| CHYPRE                 | 69.48  | 59.71      | 73.73      | 59.71      | 73.73      | 59.71      | 73.73      | 59.71      | 73.73      | 59.71      | 73.73      |
| LIBAN                  | 80.13  | 87.85      | 91.76      | 84.53      | 91.75      | 87.85      | 91.76      | 87.85      | 91.76      | 87.99      | 91.76      |
| LEVANT                 | 80.38  | 85.40      | 93.69      | 82.64      | 90.51      | 85.40      | 93.69      | 85.40      | 93.69      | 85.36      | 93.57      |
| REGION C               | 69.73  | 74.69      | 82.24      | 73.46      | 83.30      | 74.69      | 82.24      | 74.69      | 82.24      | 73.02      | 82.36      |
| TURQUIE                | 53.00  | 59.00      | 75.00      | 62.00      | 77.00      | 57.00      | 73.00      | 56.77      | 72.36      | 56.00      | 72.00      |
| SYRIE                  | 35.93  | 38.95      | 52.63      | 42.36      | 55.36      | 38.38      | 50.61      | 38.65      | 51.08      | 38.61      | 51.43      |
| EGYPTE                 | 55.73  | 46.00      | 60.00      | 47.00      | 61.00      | 45.00      | 57.00      | 44.60      | 54.00      | 44.50      | 53.30      |
| LIBYE                  | 62.17  | 72.07      | 84.76      | 72.32      | 83.37      | 72.00      | 81.67      | 71.88      | 77.53      | 71.86      | 84.22      |
| TUNISIE                | 67.47  | 73.00      | 85.00      | 78.00      | 87.00      | 75.00      | 83.00      | 71.48      | 81.48      | 70.38      | 80.60      |
| ALGERIE                | 48.00  | 59.82      | 75.00      | 62.00      | 80.08      | 57.00      | 70.00      | 56.69      | 69.71      | 56.00      | 69.08      |
| MAROC                  | 44.69  | 56.01      | 75.00      | 57.13      | 77.24      | 53.01      | 71.36      | 53.06      | 70.68      | 53.60      | 70.00      |
| REGION D               | 67.02  | 56.53      | 71.17      | 58.47      | 73.94      | 54.78      | 67.17      | 54.27      | 66.47      | 53.94      | 66.65      |
| ORIENT<br>MEDITERRANEE | 61.21  | 67.21      | 76.65      | 66.07      | 78.75      | 66.26      | 74.13      | 66.27      | 74.13      | 66.14      | 74.13      |

Table 13 IRRIGATION IN THE MEDITERRANEAN BASIN (1975-1984)

|            | Irrigated area<br>(1000 ha) |       |      | Rate of variation<br>1975-1984 (%) | Irrigated area in % of<br>arable land + permanent crops |      |           |       | Use of micro-<br>irrigation (ha) |           |
|------------|-----------------------------|-------|------|------------------------------------|---------------------------------------------------------|------|-----------|-------|----------------------------------|-----------|
|            | 1975                        | 1984  | 1984 |                                    | 1975-1984 (%)                                           | 1965 | 1974-1976 | 1984  | 1974                             | 1981-1982 |
|            |                             |       |      |                                    |                                                         |      |           |       |                                  |           |
| SPAIN      | 2 816                       | 3 145 | + 12 |                                    | 10                                                      | 14   | 15        |       |                                  |           |
| FRANCE     | 805                         | 1 160 | + 44 |                                    | ..                                                      | 4    | 6         | -     | -                                | 22 000    |
| ITALY      | 2 717                       | 2 970 | + 9  |                                    | 16                                                      | 22   | 24        | -     | -                                | 10 300    |
| MALTA      | 1                           | 1     | 0    |                                    | 6                                                       | 8    | 8         |       |                                  |           |
| YUGOSLAVIA | 130                         | 161   | + 24 |                                    | 2                                                       | 2    | 2         |       |                                  |           |
| ALBANIA    | 330                         | 390   | + 18 |                                    | 45 (*)                                                  | 49   | 55        |       |                                  |           |
| GREECE     | 887                         | 1 030 | + 16 |                                    | 14                                                      | 23   | 26        |       |                                  |           |
| TURKEY     | 1 983                       | 2 140 | + 8  |                                    | 5                                                       | 7    | 8         |       |                                  |           |
| CYPRUS     | 94                          | 94    | -    |                                    | 22                                                      | 22   | 22        | 160   | 160                              | 6 600     |
| SYRIA      | 547                         | 617   | + 13 |                                    | 9                                                       | 10   | 11        |       |                                  |           |
| LEBANON    | 86                          | 86    | -    |                                    | 11                                                      | 26   | 29        |       |                                  |           |
| ISRAEL     | 182                         | 220   | + 21 |                                    | 35                                                      | 43   | 50        | 6 070 | 6 070                            | 81 700    |
| EGYPT      | 2 799                       | 2 474 | - 14 |                                    | 100                                                     | 100  | 100       |       |                                  |           |
| LIBYA      | 200                         | 232   | + 16 |                                    | 5                                                       | 10   | 11        |       |                                  |           |
| TUNISIA    | 123                         | 210   | + 71 |                                    | 2                                                       | 3    | 4         |       |                                  |           |
| ALGERIA    | 244                         | 298   | + 22 |                                    | 4                                                       | 4    | 4         |       |                                  |           |
| MOROCCO    | 426                         | 520   | + 22 |                                    | 3                                                       | 6    | 6         |       |                                  |           |

(\*) 1970

Source : FAO/Blue Plan

Table 14. MECANISATION  
MECHANIZATION

| TRACTEURS AGRICOLES<br>AGRICULTURAL TRACTORS |           | MOISSONNEUSES-BATTEUSES<br>HARVESTERS-THRESHERS |           |           |         |
|----------------------------------------------|-----------|-------------------------------------------------|-----------|-----------|---------|
|                                              |           | 1965                                            | 1970      | 1980      | 1984    |
| ESPAGNE                                      | 111 252   | 260 578                                         | 523 907   | 611 433   |         |
| FRANCE                                       | 872 931   | 1 239 004                                       | 1 503 703 | 1 528 069 |         |
| ITALIE                                       | 342 675   | 618 732                                         | 1 072 168 | 1 200 000 |         |
| MALTE                                        | 100       | 142                                             | 410       | 443       |         |
| YOUGO-SLAVIE                                 | 46 041    | 81 636                                          | 426 399   | 579 990   |         |
| ALBANIE                                      |           | 6 200                                           | 10 500    | 10 500    |         |
| GRECE                                        | 29 696    | 62 160                                          | 140 305   | 170 000   |         |
| TURQUIE                                      | 48 043    | 105 996                                         | 436 281   | 555 227   |         |
| CYPRE                                        | 3 952     | 6 810                                           | 10 800    | 11 200    |         |
| SYRIE                                        | 6 310     | 9 131                                           | 27 544    | 37 920    |         |
| LIBAN                                        | 1 459     | 2 517                                           | 3 000     | 3 000     |         |
| ISRAEL                                       | 9 190     | 15 982                                          | 26 800    | 26 870    |         |
| EYPT                                         | 13 607    | 17 276                                          | 36 000    | 42 000    |         |
| LIBYE                                        | 2 834     | 3 867                                           | 14 000    | 27 800    |         |
| TUNISIE                                      | 11 795    | 21 000                                          | 34 000    | 26 000    |         |
| ALGERIE                                      | 27 620    | 47 172                                          | 43 693    | 52 000    |         |
| MAROC                                        | 8 000     | 12 279                                          | 24 500    | 30 000    |         |
| TOTAL                                        | 1 535 505 | 2 510 482                                       | 4 334 010 | 4 912 452 |         |
|                                              |           | 131 502                                         | 226 194   | 265 386   | 281 827 |
|                                              |           |                                                 |           |           | TOTAL   |

SOURCE : F.A.O., ANNUAIRES DE LA PRODUCTION / PRODUCTION YEARBOOKS

Table 15. CONSUMPTION TOTALE D'ENGRAIS  
FERTILIZER TOTAL CONSUMPTION  
( N + P2O5 + K2O )  
(1000 TONNES / 1000 TONS)

|             | 1967/68 | 1969/70 | 1974/75 | 1979/80 | 1984/85 |            |
|-------------|---------|---------|---------|---------|---------|------------|
| ESPAGNE     | 932     | 1 112   | 1 493   | 1 685   | 1 637   | SPAIN      |
| FRANCE      | 3 797   | 4 204   | 4 656   | 5 905   | 5 780   | FRANCE     |
| ITALIE      | 1 123   | 1 231   | 1 272   | 2 355   | 2 113   | ITALY      |
| MALTE       | 1       | 1       | 1       | 1       | 1       | MALTA      |
| YOUgoslavie | 516     | 583     | 674     | 870     | 976     | YUGOSLAVIA |
| ALBANIE     | 16      | 36      | 64      | 98      | 94      | ALBANIA    |
| GRECE       | 275     | 322     | 426     | 581     | 651     | GREECE     |
| TURQUIE     | 279     | 446     | 523     | 1 299   | 1 541   | TURKEY     |
| CHYPRE      | 16      | 21      | 14      | 17      | 20      | CYPRUS     |
| SYRIE       | 24      | 29      | 52      | 125     | 219     | SYRIA      |
| LIBAN       | 23      | 33      | 42      | 45      | 51      | LEBANON    |
| ISRAEL      | 47      | 53      | 65      | 78      | 89      | ISRAEL     |
| EGYPTE      | 281     | 348     | 429     | 604     | 851     | EGYPT      |
| LIBYE       | 9       | 9       | 22      | 60      | 115     | LIBYA      |
| TUNISIE     | 23      | 39      | 50      | 60      | 87      | TUNISIA    |
| ALGERIE     | 46      | 89      | 171     | 170     | 177     | ALGERIA    |
| MAROC       | 77      | 95      | 150     | 223     | 249     | MOROCCO    |
| TOTAL       | 7 485   | 8 651   | 10 104  | 14 176  | 14 651  | TOTAL      |

SOURCE : F.A.O FERTILIZER YEARBOOKS

Table 16.

CEREALES  
CEREALS

|            | SUPERFICIE RECOLTEE<br>HARVESTED AREA<br>(HECTARES) |            |            |            | PRODUCTION<br>(1000 TONNES / 1000 TONNES) |         |         |         |
|------------|-----------------------------------------------------|------------|------------|------------|-------------------------------------------|---------|---------|---------|
|            | 1965                                                | 1970       | 1980       | 1985       | 1965                                      | 1970    | 1980    | 1985    |
| ESPAGNE    | 7 131 296                                           | 7 406 000  | 7 341 000  | 7 485 000  | 8 675                                     | 11 821  | 18 331  | 20 917  |
| FRANCE     | 9 262 396                                           | 9 413 000  | 9 877 000  | 9 707 000  | 25 331                                    | 33 849  | 47 830  | 55 325  |
| ITALIE     | 6 294 729                                           | 5 767 000  | 5 093 000  | 4 810 000  | 14 044                                    | 16 114  | 18 205  | 18 049  |
| MALTE      | 3 452                                               | 3 000      | 2 000      | 2 000      | 5                                         | 4       | 5       | 8       |
| YOUOSLAVIE | 5 392 172                                           | 5 034 000  | 4 277 000  | 4 230 000  | 10 378                                    | 13 116  | 15 267  | 15 837  |
| ALBANIE    |                                                     | 320 000    | 405 000    | 360 000    |                                           | 538     | 869     | 1 055   |
| GRECE      | 1 731 474                                           | 1 616 000  | 1 525 000  | 1 482 000  | 2 511                                     | 3 224   | 5 277   | 4 431   |
| TURQUIE    | 12 947 300                                          | 13 330 000 | 13 751 000 | 13 405 000 | 14 831                                    | 18 030  | 25 599  | 26 506  |
| CYPRE      | 140 544                                             | 148 000    | 65 000     | 58 000     | 150                                       | 164     | 106     | 97      |
| SYRIE      | 2 203 426                                           | 2 090 000  | 2 724 000  | 2 592 000  | 1 799                                     | 1 229   | 3 914   | 2 825   |
| LIBAN      | 89 067                                              | 58 000     | 56 000     | 19 000     | 91                                        | 50      | 52      | 21      |
| ISRAEL     | 146 964                                             | 138 000    | 110 000    | 93 000     | 252                                       | 200     | 301     | 167     |
| EGYPTE     | 1 353 836                                           | 1 920 000  | 1 979 000  | 2 051 000  | 6 076                                     | 7 385   | 8 124   | 8 968   |
| LIBYE      | 502 613                                             | 375 000    | 555 000    | 407 000    | 126                                       | 113     | 215     | 235     |
| TUNISIE    | 1 617 379                                           | 1 133 000  | 1 307 000  | 1 807 000  | 693                                       | 718     | 1 196   | 2 124   |
| ALGERIE    | 2 837 866                                           | 3 064 000  | 3 979 000  | 3 524 000  | 1 771                                     | 1 882   | 2 206   | 3 058   |
| MAROC      | 4 361 733                                           | 4 629 000  | 4 462 000  | 4 592 000  | 3 583                                     | 4 558   | 4 479   | 4 878   |
| TOTAL      | 56 016 247                                          | 56 444 000 | 57 508 000 | 56 624 000 | 90 317                                    | 112 995 | 151 976 | 164 501 |

SOURCE : F.A.O., ANNUAIRES DE LA PRODUCTION / PRODUCTION YEARBOOKS

Table 17. PRODUCTION DE FRUITS ET LEGUMES  
FRUITS AND VEGETABLES PRODUCTIONS  
(1000 TONNES / 1000 TONS)

|            | LEGUMES ET MELONS<br>VEGETABLES AND MELONS |        |        |  | FRUITS |        |        |  | FRUITS A COQUES<br>TREEDUTS |       |       |            |
|------------|--------------------------------------------|--------|--------|--|--------|--------|--------|--|-----------------------------|-------|-------|------------|
|            | 1970                                       | 1980   | 1985   |  | 1970   | 1980   | 1985   |  | 1970                        | 1980  | 1985  |            |
| ESPAGNE    | 6 491                                      | 8 428  | 9 104  |  | 8 369  | 12 274 | 12 177 |  | 250                         | 285   | 364   | SPAIN      |
| FRANCE     | 7 154                                      | 6 913  | 7 391  |  | 15 206 | 15 149 | 13 788 |  | 89                          | 86    | 45    | FRANCE     |
| ITALIE     | 12 030                                     | 14 198 | 14 677 |  | 18 919 | 21 275 | 18 749 |  | 413                         | 376   | 279   | ITALY      |
| MALTE      | 38                                         | 45     | 47     |  | 10     | 8      | 9      |  |                             |       |       | MALTA      |
| YOUOSLAVIE | 2 102                                      | 2 881  | 2 747  |  | 2 958  | 2 799  | 2 346  |  | 44                          | 21    | 34    | YOUOSLAVIA |
| ALBANIE    | 225                                        | 386    | 186    |  | 116    | 125    | 166    |  | 4                           | 5     | 5     | ALBANIA    |
| GRECE      | 2 521                                      | 3 624  | 4 429  |  | 2 974  | 3 284  | 3 885  |  | 68                          | 85    | 92    | GREECE     |
| TURQUIE    | 9 002                                      | 13 290 | 16 440 |  | 6 110  | 6 925  | 8 092  |  | 373                         | 472   | 444   | TURKEY     |
| CYPRE      | 123                                        | 147    | 119    |  | 456    | 462    | 569    |  | 5                           | 3     | 5     | CYPRUS     |
| SYRIE      | 919                                        | 2 289  | 3 210  |  | 370    | 624    | 1 005  |  | 13                          | 28    | 61    | SYRIA      |
| LIBAN      | 270                                        | 280    | 387    |  | 564    | 772    | 708    |  | 5                           | 9     | 7     | LEBANON    |
| ISRAEL     | 600                                        | 744    | 906    |  | 1 610  | 1 895  | 1 957  |  | 3                           | 6     | 5     | ISRAEL     |
| EGYPTE     | 5 330                                      | 7 329  | 8 330  |  | 1 570  | 2 443  | 2 871  |  | 2                           | 2     | 3     | EGYPT      |
| LIBYE      | 205                                        | 553    | 549    |  | 94     | 157    | 221    |  | 4                           | 5     | 5     | LIBYA      |
| TUNISIE    | 599                                        | 1 016  | 1 247  |  | 345    | 545    | 595    |  | 10                          | 37    | 44    | TUNISIA    |
| ALGERIE    | 524                                        | 777    | 1 129  |  | 2 016  | 1 203  | 1 316  |  | 3                           | 4     | 8     | ALGERIA    |
| MAROC      | 892                                        | 1 363  | 1 427  |  | 1 350  | 1 606  | 1 638  |  | 13                          | 8     | 14    | MOROCCO    |
| TOTAL      | 49 025                                     | 64 263 | 72 325 |  | 63 037 | 71 546 | 70 092 |  | 1 299                       | 1 432 | 1 415 | TOTAL      |

SOURCE : F.A.O., ANNUAIRES DE LA PRODUCTION / PRODUCTION YEARBOOKS

Table 18. : FORESTS AND OTHER WOODED LAND: Covered areas (1980)

|                           | Total land area (waters excluded) (1000 ha) | Forest areas                               |              | Closed forests       |            | Open forests (1000 ha) | Other wooded land (1000 ha) | Plantations (all species) - end 1980 - (1000 ha) |
|---------------------------|---------------------------------------------|--------------------------------------------|--------------|----------------------|------------|------------------------|-----------------------------|--------------------------------------------------|
|                           |                                             | Natural forests and wooded lands (1000 ha) | % of land    | Total area (1000 ha) | % of land  |                        |                             |                                                  |
| SPAIN<br>Med. region      | 69 954<br>15 883                            | 12 511<br>1 875                            | 25.0         | 9 506                | 19         | — 3 005 —              | —                           | 3 387<br>..                                      |
| FRANCE<br>Med. region     | 34 564<br>6 748                             | 15 075<br>3 193                            | 27.6<br>31.2 | 13 875<br>3 102      | 25.4       | 792<br>— 1 091 —       | 408                         | 2 800<br>..                                      |
| ITALY<br>Med. region      | 29 402<br>23 516                            | 8 043<br>4 182                             | 27.4<br>18.3 | 6 363<br>..          | 21.6<br>.. | — 1 700 —              | ..                          | ..<br>..                                         |
| YUGOSLAVIA<br>Med. region | 25 340<br>..                                | 10 500<br>4 450                            | 41.1<br>40.0 | 9 100<br>..          | 35.6<br>.. | — 1 400 —              | ..                          | ..<br>..                                         |
| ALBANIA                   | 2 740                                       | 1 282                                      | 44.8         | 1 090                | 39.8       | — 192 —                | —                           | ..                                               |
| GREECE                    | 13 000                                      | 5 754                                      | 44.0         | 2 512                | 19.2       | — 2 242 —              | —                           | 150                                              |
| TURKEY<br>Med. region     | 77 076<br>22 294                            | 20 199<br>10 569                           | 26.2<br>67.2 | 8 856<br>..          | 11.4<br>.. | 8 843<br>..            | 3 500<br>..                 | 1 100<br>..                                      |
| CYPRUS                    | 924                                         | 173                                        | 18.7         | 153                  | 16.8       | 19                     | 1                           | 34                                               |
| SYRIA<br>Med. region      | 18 422                                      | 159                                        | 0.9          | 60                   | 2.2        | 90                     | 9                           | 40                                               |
| LEBANON<br>Med. region    | 1 023                                       | 30<br>..                                   | 2.9          | 8                    | 0          | 20                     | 10                          | 19                                               |
| ISRAEL                    | 2 023                                       | 109                                        | 5.4          | 70                   | 3.4        | 28                     | 11                          | ..                                               |
| EGYPT<br>Med. region      | 99 545<br>..                                | 0<br>0                                     | 0<br>0       | 0<br>0               | 0<br>0     | 0<br>0                 | 0<br>0                      | 40                                               |
| LIBIA<br>Med. region      | 175 594                                     | 636<br>..                                  | 0.4          | 78                   | 0          | 112                    | 446                         | 159                                              |
| TUNISIA<br>Med. region    | 15 536                                      | 601<br>..                                  | 3.9          | 163                  | 1.0        | 134                    | 204                         | 127                                              |
| ALGERIA<br>Med. region    | 238 174<br>6 823                            | 3 894<br>..                                | 1.6<br>..    | 1 021<br>..          | 0.6<br>..  | 746<br>..              | 2 127<br>..                 | 421                                              |
| MOROCCO<br>Med. region    | 44 620<br>4 195                             | 4 397<br>1 521                             | 9.9<br>37.9  | 687<br>..            | 1.5<br>..  | 2 549<br>..            | 1 161<br>..                 | 322                                              |
| MED. TOTAL                |                                             |                                            |              |                      |            |                        |                             |                                                  |

(\*) Plantations are not included from Turkey (Morocco inclusive) they are included from Spain to Greece.

Note : For the definition of "Mediterranean regions", see p. 3 and 4.

Source : Blue Plan (from FAO and other)

Table 19 : FIRE DAMAGE: Area of forest and other land burnt, 1961-1985  
(hectares)

|                       | 1961                     | 1965      | 1970   | 1975             | 1980             | 1981             | 1982             | 1983             | 1984             | 1985             |
|-----------------------|--------------------------|-----------|--------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| SPAIN                 | 34 507                   | 38 018    | 87 324 | 187 314          | 265 954          | 298 436          | 151 644          | 117 599          | 164 546          | 412 426          |
| FRANCE<br>Med. region | 43 986                   | 59 694    | 61 230 | 25 849<br>17 600 | 22 176<br>13 980 | 27 711<br>20 052 | 55 145<br>45 775 | 53 729<br>47 627 | 27 203<br>12 086 | 57 400<br>46 628 |
| ITALY                 | 43 000                   | —         | 91 176 | 71 425           | 144 302          | 242 218          | 130 239          | 223 728          | 75 272           | 190 640          |
| YUGOSLAVIA            | 14 146                   | 2 114     | 3 139  | 7 851            | 4 033            | 12 170           | 19 358           | 20 585           | 9 010            | 15 000           |
| GREECE                | 10 646                   | 27 030    | 3 189  | 30 955           | 32 965           | 81 417           | 27 372           | 19 613           | 33 655           | 105 450          |
| TURKEY<br>Med. region | 8 989                    | 3 954     | 15 019 | 17 515           | 10 546<br>7 388  | 5 470<br>3 925   | 4 018<br>2 665   | 3 554<br>2 989   | 7 358<br>5 459   | 26 007           |
| CYPRUS                | 279                      | 2 706 (1) |        |                  | 754              | 371              | 7 512            | 3 718            |                  |                  |
| SYRIA                 | 1 500 ha/year on average |           |        |                  |                  |                  |                  |                  |                  |                  |
| LEBANON               | 1 200 ha/year on average |           |        |                  |                  |                  |                  |                  |                  |                  |
| ISRAEL                | 71                       | 600       | 1 400  | 900              | 1 805            | 2 395            | 3 441            | 4 788            | 1 740            | 1 476            |
| LIBYA                 |                          |           |        |                  |                  |                  |                  | 1                | 1                | 43               |
| TUNISIA               |                          |           |        |                  |                  | 376              | 1 613            | 4 139            | 1 287            | 396              |
| ALGERIA               |                          |           |        |                  | 19 700           | 33 516           | 9 381            | 221 367          | 4 731            | 4 668            |
| MOROCCO               |                          |           |        |                  |                  | 1 707            | 1 818            | 17 730           | 1 423            | 1 888            |

(1) In 1964

Source : Blue Plan (from FAO)

Table 20. **NOMBRE DE TOURISTES INTERNATIONAUX  
NUMBER OF INTERNATIONAL TOURISTS**  
(MILLIERS/THOUSANDS)

|              | 1970          | 1975          | 1980          | 1981          | 1982           | 1983           | 1984           |              |
|--------------|---------------|---------------|---------------|---------------|----------------|----------------|----------------|--------------|
| ESPAGNE      | 15 320        | 19 800        | 22 500        | 23 800        | 25 300         | 25 583         | 27 100         | SPAIN        |
| FRANCE       | 18 130        | 25 710        | 30 100        | 31 340        | 33 467         | 34 018         | 34 812         | FRANCE       |
| ITALIE       | 14 188        | 15 500        | 22 087        | 20 036        | 22 297         | 22 140         | 22 855 *       | ITALY        |
| MALTE        | 171           | 335           | 729           | 706           | 511            | 491            | 480            | MALTA        |
| YUGOSLAVIE   | 4 749         | 5 834         | 6 410         | 6 616         | 5 955          | 5 947          | 7 224          | YUGOSLAVIA   |
| GRECE        | 1 407         | 2 840         | 4 796         | 5 034         | 5 033          | 4 778          | 5 523          | GREECE       |
| TURQUIE      | 446           | 1 201         | 865           | 997           | 1 026          | 1 178          | 1 533          | TURKEY       |
| CHYPRE       | 127           | 47            | 353           | 421           | 547            | 621            | 737            | CYPRUS       |
| SYRIE        | 409           | 678           | 1 204         | 1 043         | 831            | 836            | 976            | SYRIA        |
| LIBAN        | 900           | 1 555         | 118           |               |                |                |                | LEBANON      |
| ISRAEL       | 419           | 559           | 1 116         | 1 090         | 949            | 1 043          | 1 095          | ISRAEL       |
| EGYPTE       | 348           | 730           | 1 253         | 1 376         | 1 423          | 1 498          | 1 560          | EGYPT        |
| LIBYE        | 77            | 241           | 126           | 126 *         | 126 *          | 126 *          | 126 *          | LIBYA        |
| TUNISIE      | 411           | 1 014         | 1 602         | 2 151         | 1 355          | 1 439          | 1 580          | TUNISIA      |
| ALGERIE      | 236           | 296           | 290           | 320           | 280            | 285            | 410            | ALGERIA      |
| MAROC        | 747           | 1 242         | 1 425         | 1 567         | 1 815          | 1 877          | 1 936          | MOROCCO      |
| <b>TOTAL</b> | <b>58 085</b> | <b>77 582</b> | <b>94 974</b> | <b>96 623</b> | <b>100 915</b> | <b>101 860</b> | <b>107 947</b> | <b>TOTAL</b> |

\* : ESTIMATION PLAN BLEU / BLUE PLAN ASSESSMENT

SOURCE : ORGANISATION MONDIALE DU TOURISME / WORLD TOURISM ORGANIZATION

**Table 21. CAPACITY AND APPROPRIATION OF SOIL OF HOTEL AND  
OTHER LODGINGS  
(1984, in thousand beds and m2)**

| Country    | Number of<br>hotel beds<br>(x 1000) | Appropriation<br>of soil<br>(x 1000 m2) | Number of<br>other beds<br>(x 1000) | Appropriation<br>of soil<br>(x 1000 m2) |
|------------|-------------------------------------|-----------------------------------------|-------------------------------------|-----------------------------------------|
| SPAIN      | 840                                 | 33.600                                  | 8.923                               | 624.610                                 |
| FRANCE     | 1.590                               | 63.600                                  | 10.894                              | 762.580                                 |
| ITALY      | 1.598                               | 63.920                                  | 5.854                               | 409.780                                 |
| YUGOSLAVIA | 14                                  | 560                                     | 41                                  | 2.870                                   |
| GREECE     | 319                                 | 12.760                                  | 1.127                               | 78.890                                  |
| TURKEY     | 323                                 | 12.920                                  | 324                                 | 22.680                                  |
| CYPRUS     | 68                                  | 2.720                                   | 182                                 | 12.740                                  |
| SYRIA      | 27                                  | 1.080                                   | 137                                 | 9.590                                   |
| ISRAEL     | 23                                  | 920                                     | 71                                  | 4.970                                   |
| EGYPT      | 65                                  | 2.600                                   | 162                                 | 11.340                                  |
| LIBYA      | 48                                  | 1.920                                   | 218                                 | 15.260                                  |
| TUNISIA    | 9                                   | 360                                     | 24                                  | 1.680                                   |
| ALGERIA    | 72                                  | 2.880                                   | 77                                  | 5.390                                   |
| MOROCCO    | 27                                  | 1.080                                   | 37                                  | 2.590                                   |
| TOTAL      | 59                                  | 2.360                                   | 152                                 | 10.640                                  |
| ...        | 5.082                               | 203.280                                 | 28.223                              | 1.975.610                               |

Table 22. COASTAL TOURISM IN 1984 AND PROGNOSSES FOR THE YEARS  
2000 AND 2025  
LE TOURISME LITTORAL EN 1984 ET AUX HORIZONS 2000 ET 2025  
Nombre de touristes et nuitées

|                |    | Touristes<br>(en millions) |      |         | Nuitées<br>(en millions) |       |         |
|----------------|----|----------------------------|------|---------|--------------------------|-------|---------|
|                |    | T.I.                       | T.N. | TI + TN | T.I.                     | T.N.  | TI + TN |
| 1984           |    | 51                         | 44,7 | 95,7    | 418,2                    | 983,4 | 1.401,6 |
| Scénarios 2000 | T1 | 85,4                       | 53,9 | 139,3   | 743                      | 1.256 | 1.999   |
|                | T2 | 76,4                       | 45   | 121,4   | 664                      | 1.048 | 1.712   |
|                | T3 | 94                         | 64,1 | 158,1   | 817                      | 1.493 | 2.310   |
|                | A1 | 97,7                       | 71,4 | 169,1   | 850                      | 1.663 | 2.513   |
|                | A2 | 107                        | 77,3 | 184,3   | 930                      | 1.801 | 2.731   |
| Scénarios 2025 | T1 | 147                        | 72   | 219     | 1.205                    | 1.584 | 2.789   |
|                | T2 | 125                        | 48   | 173     | 1.025                    | 1.056 | 2.081   |
|                | T3 | 162                        | 98   | 260     | 1.328                    | 2.156 | 3.484   |
|                | A1 | 168                        | 130  | 298     | 1.377                    | 2.860 | 4.237   |
|                | A2 | 193                        | 148  | 341     | 1.582                    | 3.256 | 4.838   |

T.I. : Tourisme International  
T.N. : Tourisme National

T.I. : 47,2 % du tourisme international méditerranéen

T.N. : 42,5 % du tourisme national méditerranéen

durée moyenne 1984 : T.I. : 8,2 jours ; T.N. : 22 jours

durée moyenne 2000 : T.I. : 8,7 jours ; T.N. : 23,3 jours (+6 % globalement)

durée moyenne 2025 : T.I. : 8,2 jours ; T.N. : 22 jours.

Table 23. Estimated annual consumption of water by tourists in coastal zones ( in million m<sup>3</sup>)

|     |      | International<br>tourists | National<br>tourists | Total | Multiplying<br>coefficient |
|-----|------|---------------------------|----------------------|-------|----------------------------|
|     | 1984 | 104.6                     | 147.5                | 252   |                            |
| T-1 | 2000 | 223                       | 220                  | 443   | 1.75                       |
|     | 2025 | 361                       | 317                  | 678   | 2.7                        |
| T-2 | 2000 | 200                       | 183                  | 383   | 1.6                        |
|     | 2025 | 307                       | 211                  | 518   | 2                          |
| T-3 | 2000 | 245                       | 261                  | 506   | 2                          |
|     | 2025 | 398                       | 431                  | 829   | 3.3                        |
| A-1 | 2000 | 255                       | 291                  | 546   | 2.2                        |
|     | 2025 | 413                       | 572                  | 985   | 3.9                        |
| A-2 | 2000 | 279                       | 315                  | 594   | 2.4                        |
|     | 2025 | 475                       | 651                  | 1126  | 4.5                        |

Table 24. INDICATORS OF THE PRESSURE EXERTED BY TOURISM ON THE COASTAL ZONES

INDICATEURS DE LA PRESSION TOURISTIQUE  
DANS LES REGIONS LITTORALES

| Régions<br>Méditerranéennes                            | 1986                                |                                      |                               | 2000 - T-1                          |                                      |                               |
|--------------------------------------------------------|-------------------------------------|--------------------------------------|-------------------------------|-------------------------------------|--------------------------------------|-------------------------------|
|                                                        | Densité<br>touristique<br>(1)       | Occupation<br>linéaire côtier<br>(2) | Pression<br>sociale<br>(3)    | Densité<br>touristique<br>(1)       | Occupation<br>linéaire côtier<br>(2) | Pression<br>sociale<br>(3)    |
|                                                        | <u>touristes</u><br>km <sup>2</sup> | <u>touristes</u><br>m de côte        | <u>touristes</u><br>habitants | <u>touristes</u><br>km <sup>2</sup> | <u>touristes</u><br>m de côte        | <u>touristes</u><br>habitants |
| ESPAGNE                                                | 62                                  | 2,3                                  | 0,41                          | 84                                  | 3,1                                  | 0,47                          |
| FRANCE                                                 | 56                                  | 1,5                                  | 0,46                          | 76                                  | 2                                    | 0,32                          |
| ITALIE                                                 | 20                                  | 0,6                                  | 0,10                          | 25                                  | 0,7                                  | 0,13                          |
| YOUgoslavie                                            | 52                                  | 0,4                                  | 0,89                          | 69                                  | 0,3                                  | 0,94                          |
| GRECE                                                  | 13                                  | 0,1                                  | 0,14                          | 31                                  | 0,2                                  | 0,22                          |
| TRQUIE                                                 | 3                                   | 0,1                                  | 0,05                          | 9                                   | 0,2                                  | 0,07                          |
| MALTE                                                  | 316                                 | 0,7                                  | 0,26                          | 696                                 | 1,6                                  | 0,32                          |
| CYPRÈS                                                 | 17                                  | 0,2                                  | 0,23                          | 32                                  | 0,4                                  | 0,39                          |
| JORDIE                                                 | 51                                  | 1,2                                  | 0,18                          | 101                                 | 2,3                                  | 0,18                          |
| LIBAN                                                  | -                                   | -                                    | -                             | -                                   | -                                    | -                             |
| ISRAEL                                                 | 51                                  | 1,2                                  | 0,07                          | 79                                  | 1,8                                  | 0,09                          |
| EGYPTE                                                 | 1                                   | 0,4                                  | 0,02                          | 1,6                                 | 0,7                                  | 0,02                          |
| LIBYE                                                  | -                                   | -                                    | -                             | -                                   | -                                    | -                             |
| TUNISIE                                                | 10                                  | 0,3                                  | 0,08                          | 19                                  | 0,7                                  | 0,12                          |
| ALGERIE                                                | 4                                   | 0,2                                  | 0,02                          | 8                                   | 0,4                                  | 0,02                          |
| ✓                                                      | 6                                   | 0,6                                  | 0,08                          | 13                                  | 1,3                                  | 0,1                           |
| Ensemble des<br>régions littorales<br>Méditerranéennes | 15,6                                | 0,41                                 | 0,14                          | 23                                  | 0,61                                 | 0,17                          |

(1)  $\frac{\text{nombre de touristes} \times 0,20}{\text{superficie régions littorales km}^2}$ (2)  $\frac{\text{nombre de touristes} \times 0,20}{\text{linéaire côtier m}}$ (3)  $\frac{\text{nombre de touristes} \times 0,20}{\text{population permanente}}$ 

Note : 0,20 correspond au pourcentage de touristes résidant sur les régions côtières durant le mois de pointe qu'on a estimé à 20 % du nombre total de touristes.

Table 25. TOTAL LENGTH AND AREA OCCUPIED BY THE TRAFFIC WAYS ON LAND

|     |   | <u>Longueurs</u><br>(x 1000 km) |             | <u>Emprises</u><br>(km <sup>2</sup> ) |               |
|-----|---|---------------------------------|-------------|---------------------------------------|---------------|
|     |   | 2000                            | 2025        | 2000                                  | 2025          |
| T-1 | N | 1668                            | 1703        | 33.360                                | 34.060        |
|     | S | <u>902</u>                      | <u>1974</u> | <u>18.040</u>                         | <u>39.480</u> |
|     | T | 2570                            | 3677        | 51.400                                | 73.540        |
| T-2 | N | 1668                            | 1703        | 33.360                                | 34.060        |
|     | S | <u>939</u>                      | <u>1457</u> | <u>18.780</u>                         | <u>29.140</u> |
|     | T | 2607                            | 3160        | 52.140                                | 63.200        |
| T-3 | N | 1708                            | 1768        | 34.160                                | 35.360        |
|     | S | <u>1352</u>                     | <u>1974</u> | <u>27.040</u>                         | <u>39.480</u> |
|     | T | 3060                            | 3742        | 62.500                                | 74.840        |
| A-1 | N | 1708                            | 1768        | 34.160                                | 35.360        |
|     | S | <u>1305</u>                     | <u>1812</u> | <u>26.100</u>                         | <u>36.240</u> |
|     | T | 3013                            | 3580        | 60.260                                | 71.600        |
| A-2 | N | 1754                            | 1929        | 35.080                                | 38.580        |
|     | S | <u>1305</u>                     | <u>1812</u> | <u>26.100</u>                         | <u>36.240</u> |
|     | T | 3059                            | 3741        | 61.180                                | 74.820        |

.Longueurs totales et emprises du réseau routier  
méditerranéen selon les scénarios.

(Source : Plan Bleu)

Table 26. TOTAL LENGHT OF THE ROADS

## ... LONGUEUR TOTALE DES ROUTES 1981

|                         |             |
|-------------------------|-------------|
| ESPAGNE                 | 317814      |
| FRANCE                  | 803413      |
| ITALIE                  | 293799      |
| MALTE                   | 53,         |
| MONACO                  | 46          |
| YUGOSLAVIE              | 113383      |
| ALBANIE                 | ?           |
| GRECE                   | 37445       |
| TURQUIE                 | 232867      |
| CHYPRE                  | 10270       |
| SYRIE                   | 18844       |
| LIBAN                   | 7070        |
| ISRAEL                  | 4631        |
| EGYPTE                  | 28190       |
| LIBYE                   | ?           |
| TUNISIE                 | 23695       |
| ALGERIE                 | 72091       |
| MAROC                   | 57634       |
| <br>TOTAL MEDITERRANEEN | <br>2021967 |

(d'après International Road Federation)

Table 27 : MARINE CATCHES OF MEDITERRANEAN COUNTRIES: Fish, crustaceans and molluscs from all marine zones and the Mediterranean, 1970-1984

|            | ALL MARINE ZONES<br>(TONNES) |           |           |           |           | IN THE MEDITERRANEAN<br>(TONNES) |         |         |         |         | PROPORTION OF<br>MEDITERRANEAN<br>MARINE CATCHES<br>(%) |
|------------|------------------------------|-----------|-----------|-----------|-----------|----------------------------------|---------|---------|---------|---------|---------------------------------------------------------|
|            | 1970                         | 1975      | 1980      | 1983      | 1984      | 1970                             | 1975    | 1980    | 1983    | 1984    |                                                         |
| SPAIN      | 1 522 200                    | 1 497 359 | 1 231 780 | 1 227 345 | 1 243 581 | 124 200                          | 139 410 | 149 606 | 162 379 | 168 240 | 13.5                                                    |
| FRANCE     | 782 500                      | 784 495   | 765 676   | 774 142   | 738 813   | 45 600                           | 46 828  | 46 394  | 52 356  | 46 423  | 6.3                                                     |
| ITALY      | 383 200                      | 386 672   | 413 236   | 437 040   | 451 223   | 320 300                          | 351 976 | 352 631 | 398 635 | 409 440 | 90.7                                                    |
| MALTA      | 1 200                        | 1 506     | 1 054     | 993       | 1 216     | 1 200                            | 1 506   | 1 054   | 993     | 1 216   | 100.0                                                   |
| YUGOSLAVIA | 26 700                       | 32 251    | 34 968    | 53 238    | 48 420    | 26 700                           | 32 251  | 34 968  | 53 238  | 48 420  | 100.0                                                   |
| ALBANIA    | 4 000                        | 4 000     | 4 000     | 4 000     | 4 000     | 4 000                            | 4 000   | 4 000   | 4 000   | 4 000   | 100.0                                                   |
| GREECE     | 91 500                       | 86 482    | 95 131    | 89 454    | 91 380    | 59 100                           | 62 666  | 73 069  | 80 893  | 82 635  | 90.4                                                    |
| TURKEY     | 165 300                      | 103 226   | 394 600   | 518 359   | 520 437   | 55 660                           | 25 876  | 116 831 | 105 297 | 83 788  | 16.1                                                    |
| CYPRUS     | 1 300                        | 919       | 1 305     | 1 933     | 2 205     | 1 300                            | 919     | 1 305   | 1 933   | 2 205   | 100.0                                                   |
| SYRIA      | 1 000                        | 826       | 976       | 923       | 923       | 1 000                            | 826     | 976     | 923     | 923     | 100.0                                                   |
| LEBANON    | 2 200                        | 2 400     | 1 700     | 1 300     | 1 200     | 2 200                            | 2 400   | 1 700   | 1 300   | 1 200   | 100.0                                                   |
| ISRAEL     | 10 300                       | 9 615     | 12 053    | 9 500     | 9 710     | 3 200                            | 3 200   | 3 702   | 4 173   | 4 596   | 47.3                                                    |
| EGYPT      | 27 200                       | 25 910    | 32 249    | 26 146    | 26 146    | 12 000                           | 5 384   | 17 466  | 12 538  | 12 538  | 48.0                                                    |
| LIBYA      | 5 500                        | 4 803     | 5 200     | 7 500     | 7 800     | 5 500                            | 4 803   | 5 200   | 7 500   | 7 800   | 100.0                                                   |
| TUNISIA    | 24 400                       | 44 500    | 60 154    | 67 145    | 74 944    | 24 400                           | 44 500  | 60 154  | 67 145  | 74 944  | 100.0                                                   |
| ALGERIA    | 25 700                       | 37 693    | 48 000    | 70 000    | 75 000    | 25 700                           | 37 693  | 48 000  | 70 000  | 75 000  | 100.0                                                   |
| MOROCCO    | 250 200                      | 224 895   | 329 680   | 452 529   | 466 130   | 10 300                           | 15 202  | 27 316  | 32 314  | 41 788  | 9.0                                                     |
| JAPAN      |                              |           |           |           |           |                                  | 1 263   | 121     | 683     | 1 057   |                                                         |
| OTHER      |                              |           |           |           |           | 3 700                            | 4 652   | 994     | 845     | 1 553   |                                                         |

(1) 1974

Source : Blue Plan, from FAO

Table 28. WATER : SUPPLY AND DEMAND  
IN THE MEDITERRANEAN DRAINAGE BASIN, 1980

| COUNTRY        | (a)<br>Estimated<br>population<br>(millions) | SUPPLY (resources)                         |                                                        | DEMAND                                               |                                      | R A T I O                                                 |                                                           |
|----------------|----------------------------------------------|--------------------------------------------|--------------------------------------------------------|------------------------------------------------------|--------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------|
|                |                                              | (b)<br>total water<br>resources<br>Gm/year | (c)<br>stable or<br>stabilized<br>resources<br>Gm/year | (d)<br>water<br>distributed<br>(drawoffs)<br>Gm/year | (e)<br>net<br>consumption<br>Gm/year | (f)<br>exploitation<br>index in<br>relation to (b)<br>d/b | (g)<br>exploitation<br>index in<br>relation to (c)<br>d/c |
| SPAIN          | 15,5                                         | 28,3                                       | 24,1                                                   | 12,7                                                 | ~ 6,9                                | 43                                                        | 33                                                        |
| FRANCE, MONACO | 11,2                                         | 74                                         | ~ 39                                                   | 12,7                                                 | 2,2                                  | 17                                                        | 33                                                        |
| ITALY          | 57,3                                         | 187                                        | 50                                                     | 38,2                                                 | 22                                   | 30                                                        | 112                                                       |
| MALTA          | 0,37                                         | 0,03                                       | 0,03                                                   | 0,023                                                | 0,02                                 | 77                                                        | 77                                                        |
| YUGOSLAVIA     | 6,9                                          | 62                                         | ~ 12                                                   | 1,3                                                  | 0,3                                  | 2,3                                                       | < 12                                                      |
| ALBANIA        | 2,7                                          | 21,3                                       | ~ 7                                                    | 0,2                                                  | 0,04                                 | 1                                                         | < 3                                                       |
| GREECE         | 9,6                                          | 62,9                                       | ~ 10                                                   | 6,9                                                  | 3,6                                  | 11                                                        | < 70                                                      |
| TURKEY         | 11,0                                         | 77                                         | ~ 23                                                   | 7,3                                                  | 3,8                                  | 10                                                        | 33                                                        |
| CYPRUS         | 0,6                                          | 0,9                                        | 0,4                                                    | 0,34                                                 | 0,3                                  | 60                                                        | 135                                                       |
| SYRIA          | 1,0                                          | 4,4                                        | ~ 2,8                                                  | 2,3                                                  | 1,3                                  | 37                                                        | ~ 90                                                      |
| LEBANON        | 3,1                                          | 4                                          | 3,3                                                    | 0,6                                                  | 0,4                                  | 13                                                        | 18                                                        |
| ISRAEL         | 3,9                                          | 1,0                                        | 0,3                                                    | 1,4                                                  | 0,8                                  | 140                                                       | 463                                                       |
| EGYPT          | 41,2                                         | 57,3                                       | 55,8                                                   | 43                                                   | 41                                   | 79                                                        | 81                                                        |
| LIBYA          | 3                                            | 0,6                                        | 0,23                                                   | 1,0                                                  | 0,63                                 | 167                                                       | 435                                                       |
| TUNISIA        | 6,3                                          | 3                                          | 2,9                                                    | ~ 1,2                                                | 0,63                                 | 40                                                        | 41                                                        |
| ALGERIA        | 14,6                                         | 13,2                                       | ~ 3,1                                                  | 2,8                                                  | ~ 3,4                                | 21                                                        | 90                                                        |
| MOROCCO        | 1,7                                          | 4,0                                        | 1,3                                                    | 1,0                                                  | 0,6                                  | 25                                                        | 67                                                        |
|                | 190                                          | 572                                        |                                                        | 154                                                  | 86                                   |                                                           |                                                           |

Table 29. : SOIL RESOURCES IN THE MEDITERRANEAN COUNTRIES

|                           | Tptal. land<br>area<br>(1000 ha) | Soil groups (in percentage of total area) |            |             |          |              |            |              |              |              |  |
|---------------------------|----------------------------------|-------------------------------------------|------------|-------------|----------|--------------|------------|--------------|--------------|--------------|--|
|                           |                                  | I                                         | II         | III         | IV       | V            | VI         | VII          | VIII         | IX           |  |
| SPAIN<br>Med. region      | 50 475<br>12 192                 | 87.9<br>91.5                              | -<br>-     | 1.0<br>1.0  | 1.3<br>- | 7.3<br>4.1   | -<br>-     | 1.0<br>-     | 1.5<br>3.4   | -<br>-       |  |
| FRANCE<br>Med. region     | 54 396<br>5 884                  | ..<br>64.6                                | -<br>-     | ..<br>2.9   | -<br>-   | ..<br>31.4   | -<br>-     | -<br>-       | -<br>-       | -<br>-       |  |
| ITALY<br>Med. region      | 30 128<br>24 407                 | 75.0<br>80.5                              | 0.4<br>0.4 | -<br>-      | 1.3<br>- | 8.0<br>5.3   | 6.1<br>2.4 | 9.2<br>11.3  | -<br>-       | -<br>-       |  |
| YUGOSLAVIA<br>Med. region | 25 580                           | 74.1<br>62.4                              | 3.4<br>-   | -<br>-      | 4.0<br>- | 17.4<br>35.4 | -<br>-     | 1.1<br>2.2   | -<br>-       | -<br>-       |  |
| ALBANIA                   | 2 870                            | 92.7                                      | -          | -           | -        | 6.2          | -          | 1.1          | -            | -            |  |
| GREECE                    | 13 071                           | 70.5                                      | 0.9        | -           | -        | 16.8         | -          | 11.8         | -            | -            |  |
| TURKEY<br>Med. region     | 77 481<br>13 431                 | ..<br>64.9                                | ..<br>10.4 | -<br>-      | -<br>-   | ..<br>22.5   | ..<br>2.1  | -<br>-       | -<br>-       | -<br>-       |  |
| CYPRUS                    | 920                              | 77.9                                      | 10.9       | -           | -        | 11.2         | -          | -            | -            | -            |  |
| SYRIA<br>Med. region      | 18 520                           | 1.4<br>..                                 | 6.0<br>..  | -<br>-      | -<br>-   | 8.7<br>..    | -<br>-     | -<br>-       | 83.8<br>-    | -<br>-       |  |
| LEBANON<br>Med. region    | 1 040                            | 57.6<br>..                                | 7.8<br>..  | -<br>-      | -<br>-   | 18.3<br>..   | -<br>-     | -<br>-       | 16.3<br>..   | -<br>-       |  |
| ISRAEL                    | 2 080                            | 28.6                                      | 7.4        | 1.1         | -        | 19.1         | -          | 8.6          | 35.2         | -            |  |
| EGYPT<br>Med. region      | 99 545<br>6 644                  | 3.5<br>24.6                               | 0.1<br>-   | 6.9<br>11.8 | 1.0<br>- | 21.7<br>0.9  | -<br>-     | 18.6<br>17.3 | 32.6<br>32.0 | 15.5<br>13.4 |  |
| LIBYA<br>Med. region      | 175 954<br>20 337                | 5.7<br>14.2                               | -<br>-     | 1.4<br>4.1  | -<br>-   | 11.8<br>4.9  | -<br>-     | 9.2<br>0.5   | 49.5<br>75.8 | 22.4<br>0.4  |  |
| TUNISIA<br>Med. region    | 15 536<br>5 215                  | 20.7<br>29.6                              | 3.0<br>4.7 | 9.1<br>6.6  | -<br>-   | 29.3<br>18.9 | -<br>-     | 2.4<br>-     | 26.2<br>40.2 | 9.1<br>-     |  |
| ALGERIA<br>Med. region    | 238 174<br>9 024                 | 6.3<br>85.7                               | 0.2<br>2.4 | 2.2<br>0.3  | -<br>-   | 24.7<br>0.7  | -<br>-     | 9.3<br>0.5   | 31.6<br>10.3 | 25.7<br>-    |  |
| MOROCCO<br>Med. region    | 46 630<br>6 780                  | 31.1<br>51.1                              | 2.2<br>2.4 | 4.5<br>0.8  | 0.7<br>- | 25.9<br>0.5  | -<br>-     | 8.9<br>0.4   | 26.6<br>44.8 | -<br>-       |  |
| MED. TOTAL                |                                  |                                           |            |             |          |              |            |              |              |              |  |

Source : Blue Plan (from World Soil Map, FAO/Unesco, 1978)

Table 30 : SOIL EROSION INTENSITY, in area and for selected countries

| Country                | Importance of erosion                | Eroded area (1000 ha)     | as % of total area   | Estimated deposits (1000 m <sup>3</sup> ) | Area of arable land lost through erosion, in ha/year (% of total land) |
|------------------------|--------------------------------------|---------------------------|----------------------|-------------------------------------------|------------------------------------------------------------------------|
| SPAIN (49 719 00 ha)   | none<br>slight<br>moderate<br>severe | 27 804<br>13 744<br>8 171 | 55.9<br>27.6<br>16.5 |                                           |                                                                        |
| MEDITERRANEAN          | none                                 | 6 035                     | 38.0                 |                                           |                                                                        |
| SPAIN (1)              | slight                               | 1 250                     | 7.9                  |                                           |                                                                        |
| 115 800 000 ha)        | moderate                             | 3 356                     | 21.1                 |                                           |                                                                        |
|                        | severe                               | 5 243                     | 33.0                 |                                           |                                                                        |
| YUGOSLAVIA (2)         | slight                               | 6 626                     | 26.0                 | 28 213                                    |                                                                        |
| (20 415 000 ha)        | moderate                             | 7 264                     | 29.0                 | 54 790                                    |                                                                        |
|                        | severe                               | 4 585                     | 18.0                 | 50 568                                    |                                                                        |
|                        | excessive                            | 1 938                     | 7.0                  | 37 510                                    |                                                                        |
| GREECE (13 144 800 ha) | severe and excessive                 | 4 700 (3)                 | 35.4                 |                                           |                                                                        |
| TURKEY (4)             | none or slight                       | 5 884                     | 28.5                 |                                           |                                                                        |
| (19 863 100 ha)        | moderate to severe                   | 6 461                     | 31.5                 | 8 750 000 t/year                          | 54 237 ha/year (0.3 %)                                                 |
|                        | very severe                          | 7 445                     | 36.3                 |                                           |                                                                        |
|                        | excessive                            | 114                       | 0.6                  |                                           |                                                                        |
| MEDITERRANEAN          | none or slight                       | 1 738                     | 10.0                 |                                           |                                                                        |
| TURKEY (5)             | moderate to excessive                | 15 536                    | 90.0                 |                                           |                                                                        |
| TUNISIA                |                                      |                           |                      |                                           |                                                                        |
| ALGERIA                |                                      |                           |                      |                                           | 18 000 ha/year (1.1 %)                                                 |
| MOROCCO                |                                      |                           |                      |                                           | 22 000 ha/year (0.3 %)                                                 |

Source : Blue Plan

(1) Concerns the following regions: Andalusia, Murcia, Valencia and the Balearic islands.  
Medio Ambiente en España, 1984, 1985.

(2) The State of the Environment and the Environmental Policy in Yugoslavia, 1983

(3) In addition, 300 million hectares threatened with salinization and alkalization  
(from Review of Environmental Policies in Greece, OECD, 1981)

(4) Environmental Profile of Turkey, 1981.

The areas studied at national level only represents part of total land surface (78 058 thousand ha)

(5) Figures refer to the three Mediterranean provinces: Numana, Aegean, Mediterranean (whose total area is 22 294 thousand ha)

Table 31. DESERTIFICATION IN THREE MAJOR MEDITERRANEAN REGIONS, early 1980s

|                                             | Total productive drylands |               | Rangelands  |               | Productive dryland types |               |             |               |
|---------------------------------------------|---------------------------|---------------|-------------|---------------|--------------------------|---------------|-------------|---------------|
|                                             | Area (M ha)               | % desertified | Area (M ha) | % desertified | Area (M ha)              | % desertified | Area (M ha) | % desertified |
| Mediterranean Europe                        | 76                        | 39            | 30          | 30            | 40                       | 32            | 3           | 30            |
| Western Asia                                | 142                       | 82            | 116         | 85            | 18                       | 85            | 8           | 40            |
| Mediterranean Africa                        | 101                       | 83            | 80          | 85            | 20                       | 75            | 1           | 40            |
| For comparison purposes: Sudan-Sahel region | 473                       | 88            | 380         | 90            | 90                       | 80            | 3           | 30            |

Source : UNEP (quoted by World Resources, 1986)

Table 32. : NATIONAL PARKS: Number and surface area, as recorded in recent national publications.

| COUNTRY<br>Med. region    | NATIONAL PARKS |          |                    |
|---------------------------|----------------|----------|--------------------|
|                           | Date *         | Number   | Surface area (Ha)  |
| SPAIN<br>Med. region      | 1985           | 9        | 112,689            |
| FRANCE<br>Med. region     | 1986           | 6<br>4   | 124,670<br>75,678  |
| ITALY<br>Med. region      | 1984           | 5<br>3   | 273,400<br>66,400  |
| YUGOSLAVIA<br>Med. region | 1976/83        | 15<br>10 | 301,704<br>82,756  |
| GREECE                    | 1983           | 10       | 350,000            |
| TURKEY<br>Med. region     | 1985           | 17<br>8  | 271,032<br>170,390 |
| CYPRUS                    |                | ..       | ..                 |
| SYRIA                     | 1980           | -        | -                  |
| LEBANON                   | 1985           | -        | -                  |
| ISRAEL                    | 1985           | 2        | 15,140             |
| EGYPT                     | 1980           | -        | -                  |
| LIBYA                     | 1985           | 1        | 30,000             |
| TUNISIA<br>Med. region    | 1985           | 4<br>4   | 36,102<br>36,102   |
| ALGERIA<br>Med. region    | 1985           | 7<br>6   | 170,000<br>160,000 |
| MOROCCO<br>Med. region    | 1980           | 2<br>1   | 36,580<br>580      |

\* date of publication of document consulted

Table 33. ASSESSMENT OF COASTAL POLLUTION BY DOMESTIC WASTE

EVALUATION DE LA POLLUTION DOMESTIQUE SUR LE LITTORAL NORD  
(ESPAGNE, FRANCE, ITALIE, YOUGOSLAVIE, GRECE)

## HYPOTHESES :

|             | POPULATION<br>(MILLIERS) | TAUX<br>D'URBAN.<br>(%) | CONSUMMATION D'EAU<br>URBAINE<br>(M3/HAB) | CONSUMMATION D'EAU<br>RURALE<br>(M3/HAB) | RACCORDEMENT A L'EGOUT<br>URBAIN<br>(%) | RACCORDEMENT A L'EGOUT<br>RURAL<br>(%) |
|-------------|--------------------------|-------------------------|-------------------------------------------|------------------------------------------|-----------------------------------------|----------------------------------------|
| SCENARIO T1 |                          |                         |                                           |                                          |                                         |                                        |
| 1985        | 72629                    | 69                      | 91                                        | 54                                       | 70                                      | 15                                     |
| 2000        | 76414                    | 75                      | 109                                       | 65                                       | 78                                      | 18                                     |
| 2025        | 76300                    | 82                      | 109                                       | 73                                       | 80                                      | 20                                     |
| SCENARIO T2 |                          |                         |                                           |                                          |                                         |                                        |
| 1985        | 72629                    | 69                      | 91                                        | 54                                       | 70                                      | 15                                     |
| 2000        | 76025                    | 76                      | 109                                       | 65                                       | 78                                      | 18                                     |
| 2025        | 76503                    | 85                      | 109                                       | 73                                       | 80                                      | 20                                     |
| SCENARIO T3 |                          |                         |                                           |                                          |                                         |                                        |
| 1985        | 72629                    | 69                      | 91                                        | 54                                       | 70                                      | 15                                     |
| 2000        | 77013                    | 75                      | 109                                       | 65                                       | 78                                      | 18                                     |
| 2025        | 80537                    | 81                      | 109                                       | 73                                       | 80                                      | 20                                     |
| SCENARIO A1 |                          |                         |                                           |                                          |                                         |                                        |
| 1985        | 72629                    | 69                      | 91                                        | 54                                       | 70                                      | 15                                     |
| 2000        | 77013                    | 74                      | 109                                       | 65                                       | 78                                      | 18                                     |
| 2025        | 80537                    | 79                      | 109                                       | 73                                       | 80                                      | 20                                     |
| SCENARIO A2 |                          |                         |                                           |                                          |                                         |                                        |
| 1985        | 72629                    | 69                      | 91                                        | 54                                       | 70                                      | 15                                     |
| 2000        | 80615                    | 74                      | 109                                       | 65                                       | 78                                      | 18                                     |
| 2025        | 90492                    | 79                      | 109                                       | 73                                       | 80                                      | 20                                     |

## RESULTATS :

|             | REJETS<br>(MILLIONS DE M3) | DBO    | DCO    | MES<br>(MILLIERS DE TONNES) | MOT    | M     | P    |
|-------------|----------------------------|--------|--------|-----------------------------|--------|-------|------|
| SCENARIO T1 |                            |        |        |                             |        |       |      |
| 1985        | 2294.7                     | 996.7  | 2246.0 | 1316.9                      | 1413.0 | 127.8 | 15.5 |
| 2000        | 3281.6                     | 1140.3 | 2563.7 | 1414.2                      | 1748.2 | 158.1 | 19.2 |
| 2025        | 3583.3                     | 1199.2 | 2692.3 | 1431.0                      | 1918.2 | 173.4 | 21.0 |
| SCENARIO T2 |                            |        |        |                             |        |       |      |
| 1985        | 2294.7                     | 996.7  | 2246.0 | 1316.9                      | 1413.0 | 127.8 | 15.5 |
| 2000        | 3310.9                     | 1148.7 | 2582.5 | 1422.5                      | 1764.1 | 159.5 | 19.3 |
| 2025        | 3676.1                     | 1219.2 | 2736.2 | 1440.1                      | 1971.3 | 178.2 | 21.6 |
| SCENARIO T3 |                            |        |        |                             |        |       |      |
| 1985        | 2294.7                     | 996.7  | 2246.0 | 1316.9                      | 1413.0 | 127.8 | 15.5 |
| 2000        | 3313.6                     | 1150.5 | 2586.5 | 1425.7                      | 1765.4 | 159.6 | 19.3 |
| 2025        | 3728.4                     | 1254.9 | 2818.1 | 1507.1                      | 1993.8 | 180.3 | 21.8 |
| SCENARIO A1 |                            |        |        |                             |        |       |      |
| 1985        | 2294.7                     | 996.7  | 2246.0 | 1316.9                      | 1413.0 | 127.8 | 15.5 |
| 2000        | 3262.8                     | 1140.4 | 2564.5 | 1422.5                      | 1736.7 | 157.0 | 19.0 |
| 2025        | 3665.3                     | 1242.2 | 2790.2 | 1503.1                      | 1957.5 | 177.0 | 21.5 |
| SCENARIO A2 |                            |        |        |                             |        |       |      |
| 1985        | 2294.7                     | 996.7  | 2246.0 | 1316.9                      | 1413.0 | 127.8 | 15.5 |
| 2000        | 3415.4                     | 1193.8 | 2664.4 | 1489.1                      | 1818.0 | 164.4 | 19.9 |
| 2025        | 4118.4                     | 1395.7 | 3135.1 | 1688.9                      | 2194.5 | 198.9 | 24.1 |

Table 34. ASSESSMENT OF COASTAL POLLUTION BY DOMESTIC WASTE

EVALUATION DE LA POLLUTION DOMESTIQUE SUR LE LITTORAL SUD ET EST  
(TURQUIE, SYRIE, EGYPTE, LIBYE, TUNISIE, ALGERIE, MAROC)

## HYPOTHESES :

|             | POPULATION<br>(MILLIERS) | TAUX<br>D'URBAN.<br>(%) | CONSUMMATION<br>URBAINE<br>(M3/HAB) | D'EAU<br>RURALE<br>(M3/HAB) | RACCORDEMENT A L'EGOUT<br>URBAIN<br>(%) | RURAL<br>(%) |
|-------------|--------------------------|-------------------------|-------------------------------------|-----------------------------|-----------------------------------------|--------------|
| SCENARIO T1 |                          |                         |                                     |                             |                                         |              |
| 1985        | 49805                    | 47                      | 36                                  | 18                          | 50                                      | 10           |
| 2000        | 70514                    | 56                      | 39                                  | 20                          | 55                                      | 12           |
| 2025        | 105914                   | 71                      | 45                                  | 23                          | 65                                      | 13           |
| SCENARIO T2 |                          |                         |                                     |                             |                                         |              |
| 1985        | 49805                    | 47                      | 36                                  | 18                          | 50                                      | 10           |
| 2000        | 75229                    | 58                      | 36                                  | 18                          | 50                                      | 10           |
| 2025        | 120604                   | 73                      | 36                                  | 18                          | 45                                      | 10           |
| SCENARIO T3 |                          |                         |                                     |                             |                                         |              |
| 1985        | 49805                    | 47                      | 36                                  | 18                          | 50                                      | 10           |
| 2000        | 69753                    | 54                      | 41                                  | 20                          | 55                                      | 12           |
| 2025        | 102931                   | 67                      | 54                                  | 27                          | 70                                      | 20           |
| SCENARIO A1 |                          |                         |                                     |                             |                                         |              |
| 1985        | 49805                    | 47                      | 36                                  | 18                          | 50                                      | 10           |
| 2000        | 66710                    | 54                      | 41                                  | 20                          | 55                                      | 12           |
| 2025        | 93403                    | 66                      | 54                                  | 27                          | 70                                      | 20           |
| SCENARIO A2 |                          |                         |                                     |                             |                                         |              |
| 1985        | 49805                    | 47                      | 36                                  | 18                          | 50                                      | 10           |
| 2000        | 64502                    | 53                      | 41                                  | 20                          | 55                                      | 12           |
| 2025        | 87641                    | 66                      | 54                                  | 27                          | 70                                      | 20           |

## RESULTATS :

|             | REJETS<br>(MILLIONS DE M3) | DBO<br>..... | DCO<br>..... | MES<br>(MILLIERS DE TONNES) | MOT<br>..... | N<br>..... |
|-------------|----------------------------|--------------|--------------|-----------------------------|--------------|------------|
| SCENARIO T1 |                            |              |              |                             |              |            |
| 1985        | 544.2                      | 527.3        | 1198.6       | 854.3                       | 523.7        | 47.3       |
| 2000        | 887.8                      | 806.4        | 1827.9       | 1228.2                      | 912.1        | 82.5       |
| 2025        | 1777.9                     | 1397.0       | 3152.0       | 1902.8                      | 1899.8       | 171.8      |
| SCENARIO T2 |                            |              |              |                             |              |            |
| 1985        | 544.2                      | 527.3        | 1198.6       | 854.3                       | 523.7        | 47.3       |
| 2000        | 881.7                      | 840.6        | 1907.0       | 1304.1                      | 916.8        | 82.9       |
| 2025        | 1474.8                     | 1383.9       | 3136.5       | 2102.1                      | 1573.2       | 142.2      |
| SCENARIO T3 |                            |              |              |                             |              |            |
| 1985        | 544.2                      | 527.3        | 1198.6       | 854.3                       | 523.7        | 47.3       |
| 2000        | 900.0                      | 790.7        | 1792.8       | 1212.7                      | 882.2        | 79.8       |
| 2025        | 2018.8                     | 1373.0       | 3096.6       | 1854.0                      | 1889.8       | 170.9      |
| SCENARIO A1 |                            |              |              |                             |              |            |
| 1985        | 544.2                      | 527.3        | 1198.6       | 854.3                       | 523.7        | 47.3       |
| 2000        | 857.6                      | 754.2        | 1710.3       | 1159.2                      | 838.1        | 75.8       |
| 2025        | 1820.8                     | 1240.8       | 2799.0       | 1680.8                      | 1700.6       | 153.8      |
| SCENARIO A2 |                            |              |              |                             |              |            |
| 1985        | 544.2                      | 527.3        | 1198.6       | 854.3                       | 523.7        | 47.3       |
| 2000        | 827.4                      | 728.1        | 1651.3       | 1120.5                      | 807.2        | 73.0       |
| 2025        | 1711.2                     | 1165.5       | 2629.0       | 1577.5                      | 1599.1       | 144.6      |