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MEDITERRANEAN ACTION PLAN

Fifth Ordinary Meeting of the Contracting Parties
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Mediterranean Sea against pollution and its
related protocols

Athens, 7-11 September 1987

MAIN FINDINGS OF THE BLUE PLAN
AND
SUGGESTIONS FOR ACTION

(DRAFT DOCUMENT)

I. A PROSPECTIVE APPROACH

1. For the first time, all the countries of a major region of the world have combined their efforts in order to explore the dynamic relationships between their economic and social development and their common environment, including the sea they surround. This study and reflection on the possible futures of the Mediterranean Basin is the subject of the "Blue Plan", formulated within the framework of the Mediterranean Action Plan adopted in Barcelona in 1975 under the auspices of the United Nations Environment Programme. The Blue Plan is therefore, first and foremost, a prospective study intended to throw light on the relationships between development and the environment in the region, to illustrate the future consequences of decisions taken -or not taken- now, to highlight the linkages between events and action, to identify issues, and to detect potential breaking points.

2. The report contains the findings of the Blue Plan "scenarios", -possible images of the future- which have been constructed, at the request of the countries concerned, for the whole of the Basin, according to consistent sets of hypotheses on economic growth, environmental policies and Mediterranean co-operation, for the 2000 and 2025 horizons. The prospective study is neither a prognosis nor a forecast of what the future holds, and the long-term visualizations outlined in the report are not intended to furnish easy formulas for action. Carried out by independent experts, the work, however, provides authorities and planners in the various countries with the opportunity of continuously setting their national development strategies within a context that assures, as far as possible, protection of the Mediterranean environment. In addition, it facilitates identification of useful areas of co-operation focusing this common objective.

3. The Blue Plan approach was formulated at the level of the Mediterranean Basin as a whole. Its global nature may conceal local trends stemming from specific circumstances, and does not provide for an accurate description of what may happen in a given spot in the Basin. Nor can it take into account unexpected events and sudden disruptions, such as ideological or political upheavals, natural disasters or serious technological accidents. It has, however, used as far as possible the studies prepared by the countries themselves. It provides the general context in which these local trends and events may occur, a context which, ultimately, has a profound influence on them.

4. The findings of the Blue Plan "scenario" exercise highlight a number of salient points. The first is the fact that, over the periods under consideration, natural resource management and environmental protection is viewed in a substantially different way by the countries to the north of the Basin and those to the south and east, for reasons stemming from both differences in level of economic development and the contrast in population trends, as well as climatic variations.

5. At the same time, the whole exercise confirms an assumption on which it was largely based, namely that the strategies and national development policies pursued by the Mediterranean countries have a significant impact on the state of the environment in the region and on its protection. It shows in particular that protection of the Mediterranean Sea, its shores and coastal regions cannot be assured through action carried out on the sea alone, or on these regions alone. Protection depends largely on the development, environment and physical planning policies followed by the Mediterranean countries at the national level in its entirety. It also depends on economic and commercial interactions between these countries as a whole and the rest of the world in various sectors of economic activity -agriculture, industry, energy, tourism and transport.

6. The various scenarios envisaged, whether they are based on the continuation, more or less enhanced, of current trends (the so-called "trend" scenarios), or on a more goal-oriented alignment of Mediterranean co-operation, at the level of both the environment and development (the so-called "alternative" scenarios), lead to "images" of the Mediterranean environment that do not radically differ at the 2000 horizon, very close to the present and virtually already determined. Whatever the scenario, up to this date the situation is in fact more or less manageable in most countries through contingency action, provided that declared policies and stipulated regulations are in fact implemented. The scenarios for the 2025 horizon, however, indicate that the situation is likely to deteriorate considerably thereafter. Considering the time lag necessary for obtaining significant effects from environmental protection, current policies should be replaced by more energetic ones, requiring immediate implementation if the serious shortages and irreversible degradation threatening the future of the

Mediterranean are to be avoided or attenuated, particularly concerning soil, water, forests, coastal planning and the urban environment.

7. At the same time, the exercise implies that, in any event, even in the most favorable scenarios, protection of the Mediterranean environment, especially the coastal strip, will be difficult in the long run because of growing human pressure and the vulnerability of the natural environment, particularly in the south and east of the Basin. The continuous and unswerving determination of governments and public authorities, based on the active and lasting support of the populations concerned, is therefore needed to ensure environmental protection. The most favorable scenarios in fact imply a permanent mobilization on behalf of the environment.

8. During the coming decades considerable investment will be required to ensure an economic and social development compatible with the needs of the Mediterranean population, especially in the south and east of the Basin. Environmental protection should be incorporated in this investment from the start and should not be considered, as is still too often the case, as an additional cost, which can be postponed until later. In fact, environmental protection and the search for lasting development may be a source of employment and wealth. The main fact that emerges from the scenarios is that, in the case of the Mediterranean Basin, development itself will only be achieved through protection of the environment : without it, the fragility of the environment enhances the vulnerability of natural resources, and living conditions, the charm of the region, deteriorate to the disadvantage of the population and visitors alike.

9. The extent of the environment-related problems stemming from socio-economic constraints affecting countries in the south or east of the Basin -in all the scenarios despite their fairly broad range- shows that the efforts undertaken at the national and local level, however significant and relevant they may be, will not suffice. Increased North-South solidarity and South-South co-operation are fundamental for the protection of the sea and the Basin as a whole. Solidarity and co-operation for environmental protection are not confined to action focusing on this area per se, but seem to imply, in addition, the

harmonious growth of intra-Mediterranean trade (making it possible, in particular, to remedy food shortages), the development of communication systems (in all forms), a mobilization geared to new technologies adapted to the conditions of the region, and a better understanding of each and everyone in the Mediterranean of the demand of the future.

10. The Blue Plan scenarios do not attempt to provide optimistic or pessimistic views of the future, but simply a basis for reflection in order to initiate action in each Mediterranean country and at the level of the Mediterranean Action Plan itself. They show that the region's environment will be subject to increasingly strong pressure, but that ways exist to reduce considerably the effects of these constraints. Among these options, the most important ones, to be described in detail in the following chapters, seem therefore to be :

- the search for new forms of development in the region, based on stronger intra-Mediterranean co-operation and more resolute North-South solidarity ;
- the systematic consideration of the environment in all sectors of development, in particular at the level of coastal areas :
- the promotion of a better understanding of the interactions between development and the environment in the Mediterranean, leading to the adoption of new forms of behaviour among, on the one hand, national or local officials from both the public or private sectors and, on the other hand, all Mediterranean people.

11. After these general observations, the following pages present the main conclusions of the Blue Plan Mediterranean scenarios, and suggestions for action stemming from them. This document is therefore a summary of the preliminary report on the scenarios*, and is intended more especially for officials and decision-makers who wish to acquire an overall view of the work and its implications. It starts with a review of the various Mediterranean development scenarios and their consequences on the environment, followed by an analysis of possible trends for the various components of the Mediterranean environment, and ends with suggestions for action which could be considered, first at the national level, then at the Mediterranean level by way of co-operation among the countries concerned.

* Document ref. UNEP/WG.171/3.

II. MEDITERRANEAN DEVELOPMENT AND
ITS RELATIONSHIPS WITH THE ENVIRONMENT

I. DEVELOPMENT PATTERNS

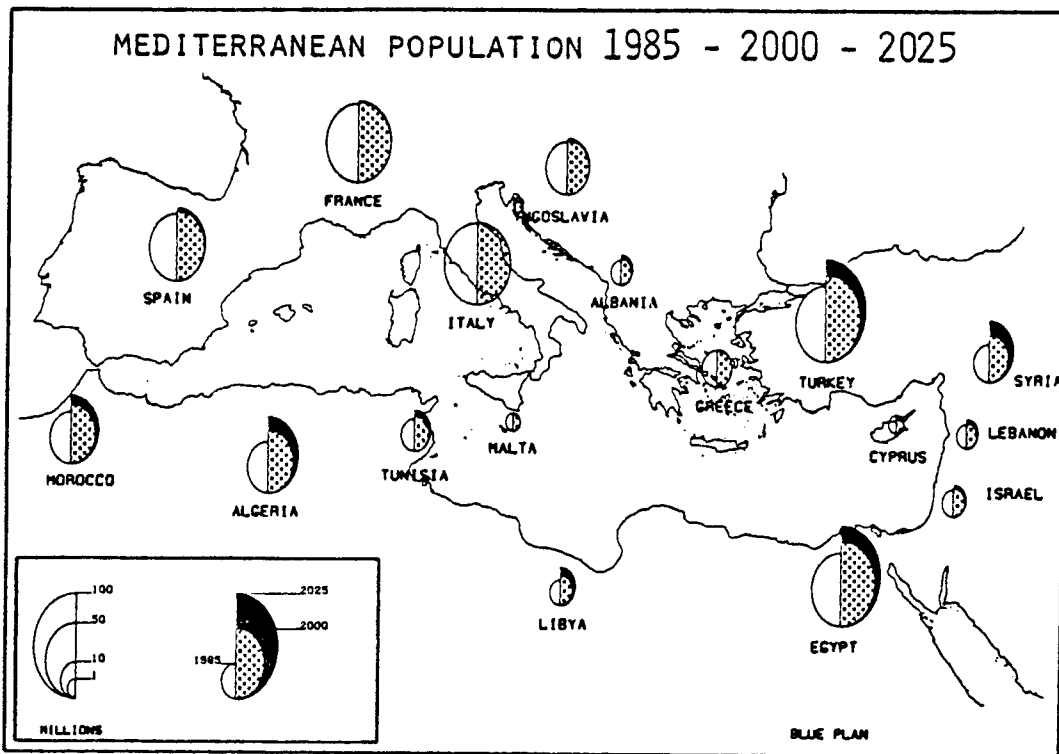
12. Development patterns have an impact on various aspects of the environment. The Blue Plan scenarios studied in particular the impact of population and urbanization, agriculture, industry, energy, tourism and transport on the Mediterranean environment. The aim of the prospective exercise is not to recommend types of development, but to illustrate the impact they may have on the environment. These types of development are greatly affected by the kinds of international economic relations established between countries (particularly by the forms of co-operation between countries of the North and those of the South, or between countries of the South) and, at the national level, by the constraints of space and natural resources, and the country's choice of development/environment strategies.

13. Three comparatively varying kinds of development have been envisaged :

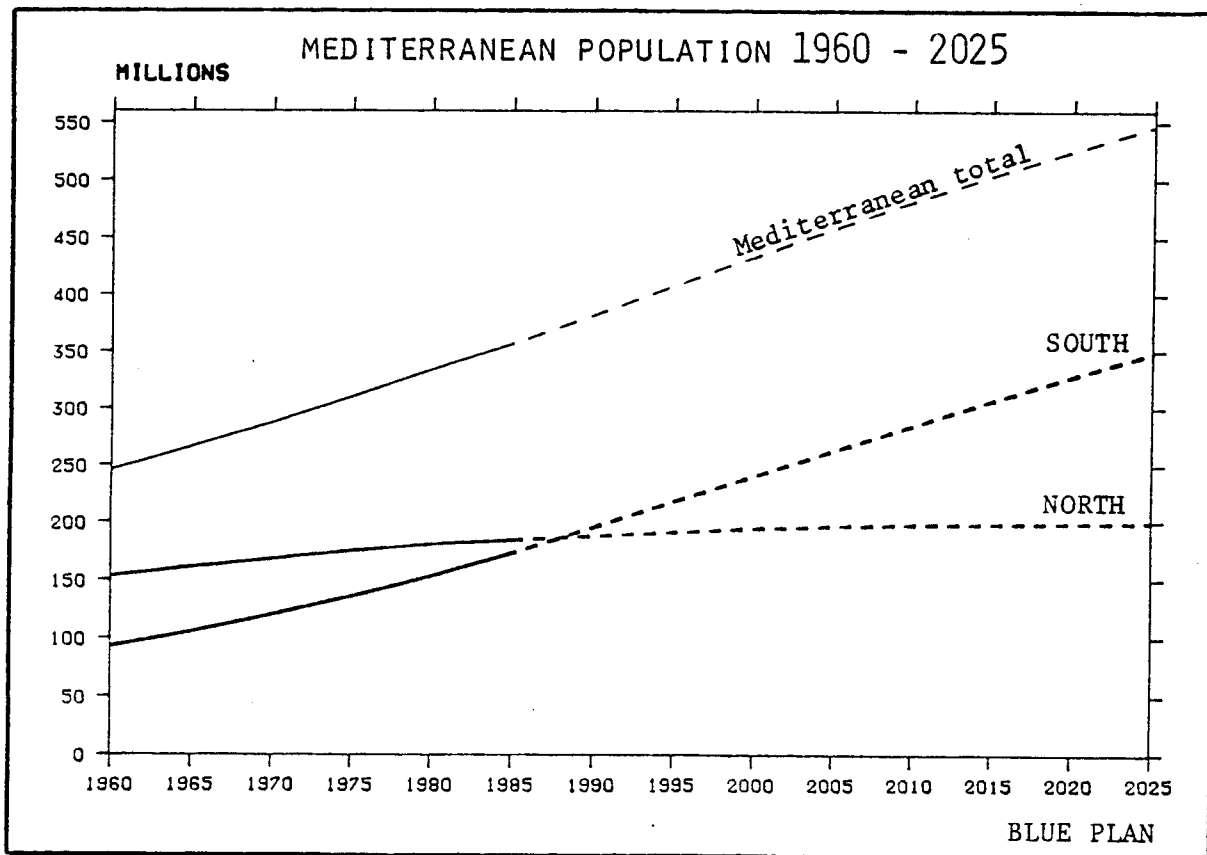
1) development with weak economic growth. If world economic trends are reflected by slow growth in the Mediterranean countries, budgetary constraints could greatly hamper the maintenance and investment operations needed for environmental protection. It would be more difficult to enforce regulations (as industrial enterprises would be in a more delicate situation) and they would be less effective because of lack of new investment. (This situation corresponds to the Blue Plan "worst trend scenario").

2) Development with fast growth, but neglectful of the environment. This fast growth could entail serious, even irreversible, damage to the environment because of the greatly increased pressure on resources and the difficulty in gearing efforts to compensate for the harm done (with a certain time lag). (This situation corresponds to the Blue Plan "moderate trend scenarios".)

3) Well-balanced development, concerned for the environment. The combination of certain choices of national strategy (a priori involving environmental regulation policies) and strong international co-operation (North-South and South-South) could produce a compatibility between



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economic growth and protection of the Mediterranean environment. (This situation corresponds to the Blue Plan "alternative scenarios".)

14. To give a schematic example, the kind of relationship existing between a domestic economy and the international economy, and the degree of food self-sufficiency chosen, conditions a country's agricultural development and therefore the intensity of pressure on soil and water resources. The reduction or deterioration of these resources would in turn represent a constraint, even a curb, on continued agricultural development.

15. Economic indicators will naturally differ greatly at the 2000 and 2025 horizons, depending on the various kinds of development. Thus per capita GNP for the countries in the south and east of the Basin (from Morocco to Turkey, excluding Libya because of its special position as an oil exporter) would rise from a range of \$6 20 - 1 050 in 1984 to :

- \$900 - 1 500 per capita in 2025 in the case of slow economic growth, corresponding approximately to a doubling in forty years ;
- \$1 200 - 2 600 per capita in the case of faster economic growth, which tends, however, to neglect resources and the environment ;
- \$2 000 - 3 500 per capita in the case of sustained growth, based on the optimized management of resources and the environment, within the framework of active international co-operation.

16. Finally, as regards the environment, development strategies could differ as to their specific combination of the various regulatory mechanisms used, such as regulations, incentives, and/or direct intervention.

II. POPULATION TRENDS AND THE ACCELERATION OF URBANIZATION

17. Depending on the types of development envisaged, the population of the Mediterranean Basin coastal countries as a whole, currently around 360 million, would reach between 520 million and 570 million in 2025. The difference between the two figures is equivalent to the population of Egypt or Turkey in 1987. The countries to the north of the Basin, from Spain to Greece, will only account for about one third of the total population in 2025, compared to two thirds in 1950 and about half today.

On the contrary, the countries in the south and east of the Basin, from Morocco to Turkey, will contain nearly two thirds of the total Mediterranean Basin population in 2025, i.e. twice their current number and nearly five times more than in 1950.

18. The trend in fertility rates will be at the root of this difference between these two sides of the Basin : levels often below the population replacement threshold in the north (2.1 children per women of childbearing age), estimated fertility indicators remaining very high - although in comparative decline- with 5 children or more per woman in the south and east (and higher in rural areas than in the cities). Thus the Mediterranean Sea is increasingly becoming one of the boundaries separating two adjoining areas with completely contrasting demographic features. It is estimated that the population in the south and east will not reach replacement level (stable population with zero growth rates) until the second half of the twenty-first century.

19. The age structure of the population will clearly play a vital role in the labour market in 2000 and 2025, although the true activity rates are extremely uncertain. In the countries to the north of the Basin, the working age population (theoretical difference between the entries in the 15 - 24 age group and the withdrawals in the 55 - 64 age group) will increase less and the labour force will become older. At the beginning of 2000, the labour force should even start to decline in some countries, reflecting the serious shortage of young adults on the labour market. The entry of women into the labour force should continue and could partly compensate the shortage. In the countries to the south and east of the Basin, with comparatively high fertility rates, the potential entries will grow faster than the withdrawals and the gap will be increasingly large until it peaks around 2000. Demand pressure will therefore considerably worsen employment problems, all the more severe in the case of development with weak economic growth (and probably strong population growth).

20. Whatever kind of development is pursued, urbanization will continue at a fast pace : close to a ceiling rate (70 % to 80 %) for the countries in the north of the Basin, tending towards to these figures in the southern and eastern countries (mostly between 40 % and 50 % today).

In these southern and eastern countries, urbanization often precedes industrialization and development (heightening the phenomenon of illegal squatters settlements), contrary to the situation in the north. A certain variation in forms of urbanization can however be observed for these countries according to the type of development :

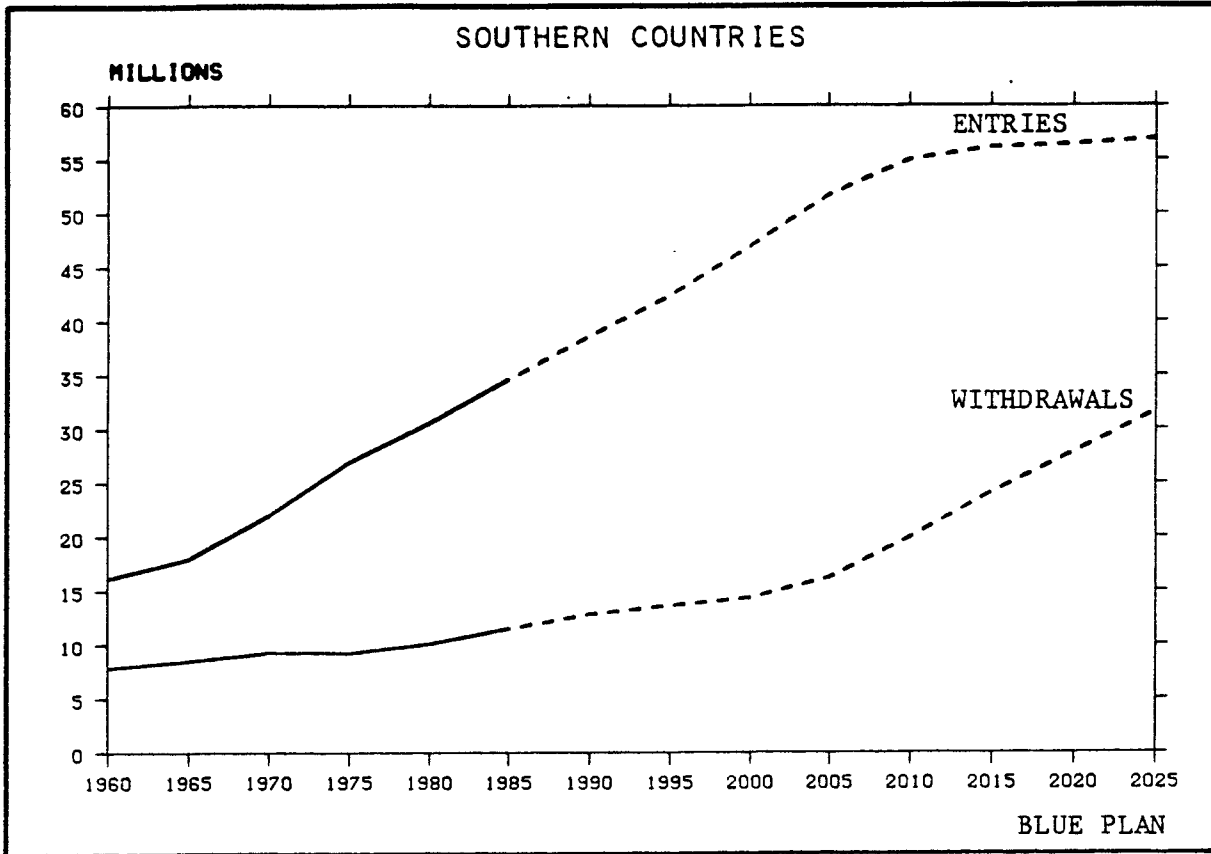
- in the case of prolonged weak economic growth, urbanization would be more or less rapid and difficult to handle because of the financial weight of infrastructure.

- The situation would be similar if economic growth started to accelerate without domestic countermeasures and international co-operation, as was observed here and there in the seventies.

In both cases the growth rate of the large cities, or "megalopolises", will entail or accentuate well-known imbalances (overcrowded and unhealthy shantytowns). The major capitals already monopolize between 30 % and 60 % of urban employment, and their sphere of economic influence extends over the whole of the country (unlike other cities, with limited spheres of influences).

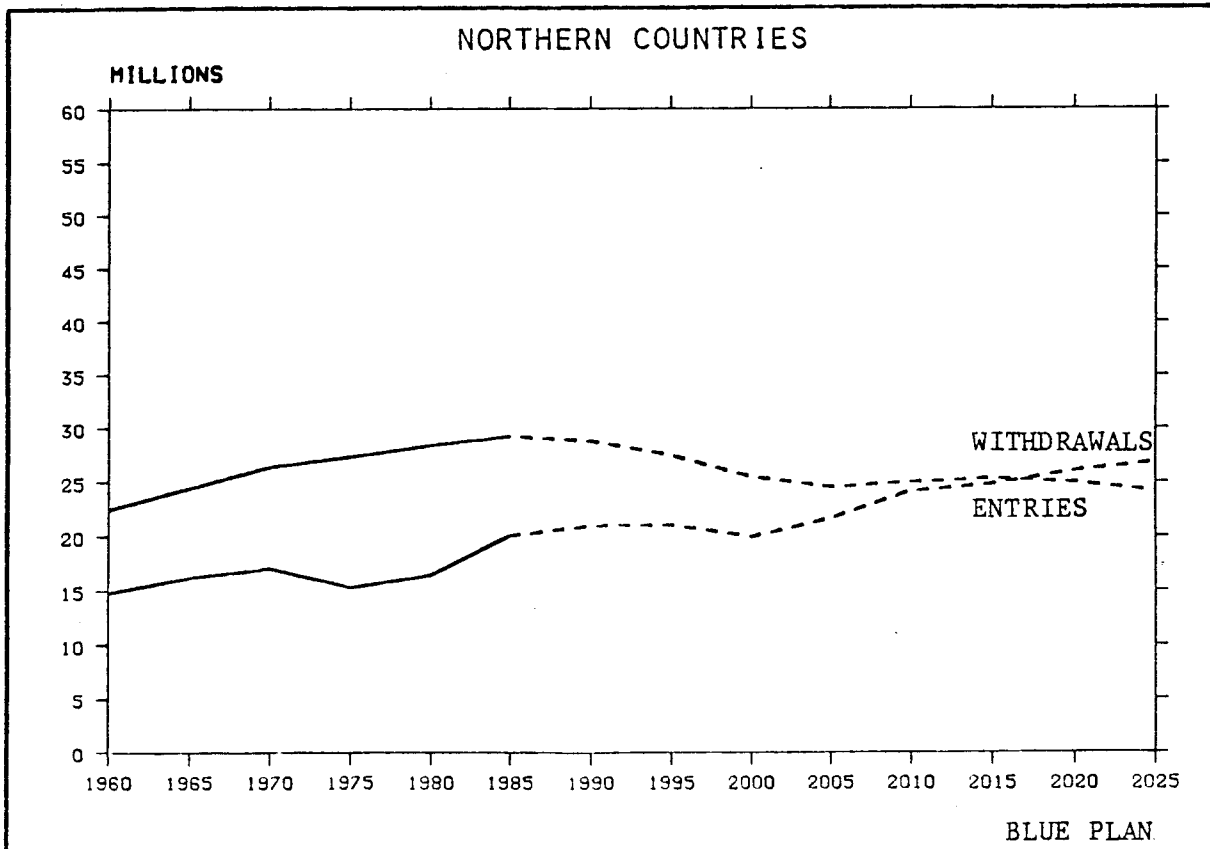
- A longer term view of development, concerned for environmental protection, will aim at attenuating the urbanization rate and also moderating both its social and environmental effects. A policy of this kind implies not only urban infrastructure measures, an area where international assistance could be applied, but also the search for innovation in urbanization. In addition, it requires the formulation of land use plans within economic development plans, ensuring a share of income -therefore employment- to both small- and medium-sized towns which would be developed, and to rural areas. Agricultural and industrial policy would then play a crucial role in curbing the rural exodus, or at least in channelling it towards small- and medium-sized towns, since government policy would be linked through trade to the general lines of Mediterranean, co-operation.

21. Depending on development patterns, the urban population of the Mediterranean Basin could number between 380 million and 440 million, compared to a little more than 200 million today. The difference between the two figures is equal to six to seven cities the size of Cairo in 1987. Varying development patterns cause not only quantitative differences but also considerable qualitative differences, as regards



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homes supplied with drinking water, electricity, infrastructure and services, i.e. with respect to the quality of life or, on the contrary, the poverty of the life-style. Studies indicate to what extent the efforts, on the part of most countries in the south and east of the Basin, although considerable, have been insufficient compared to the extent and urgency of housing needs.

22. The faster the population grows, the more vigilant and forceful environmental protection policies will have to be. The expansion of cities will continue to exert considerable pressure on agricultural land in a number of countries where it is the most scarce, and in most of the coastal regions. The coastal urban population, currently some 100 million, will reach between 150 million and 175 million in 2025, with very strong growth in the southern and eastern countries, where urbanization rates are likely to exceed 80 % in some coastal areas.

23. In the coastal regions of these countries, the demand for urban domestic water could reach between 3 - 3,500 million cubic metres (per capita demand rising with economic development, but more or less offset by lower levels of population growth). Depending the rate of connection to the urban sewage system, coastal effluent in these countries in 2025 would amount to between 1,400 million cubic metres (in the case weak economic growth) and 2,000 million cubic metres (well-balanced growth). In addition to individual water demand and the rate of connection to urban sewage systems, development patterns also influence types of waste water treatment : more than 2.1 million tonnes of suspended particulate matter discharged into the sea in 2025 in the case of weak economic growth ; less than 1.6 million tonnes in the case of balanced growth concerned for the environment.

24. With respect to population and urbanization, even the most goal-oriented national policy will have great difficulty reversing the expected trends (inter alia for urbanization rates). Rigorous physical planning could however reduce the problem of major cities through a strategy promoting small- and medium-sized towns and hinterlands ; the range of this action could involve one quarter of the new generations.

III. PROSPECTS FOR THE FOOD AND AGRICULTURE SECTOR

25. Agriculture has a strong impact on the environment on account of its massive and unparalleled consumption of water and land ; situations differ greatly, however, between European countries and the other countries in the Basin. The latter (excluding Turkey) are characterized by limited natural resources, particularly water, a comparatively low technological level (barring exceptions), and an unstable food situation. Much influenced by its natural and historic context, the development of Mediterranean agriculture also depends to a great extent on the agricultural policy decisions of the major producing countries in the area, as well as on the organization of international trade.

26. Already favoured by their level of development, the countries in the north of the Basin experienced rising output following the materialization of the European Economic Community, to the point of largely achieving, even exceeding, their self-sufficiency in most staple foods. At the same time, the countries, in the south and east of the Basin, subject to the constraint of lack of resources and to population pressure, are suffering from stagnating productivity and a structural, and often rising, food deficit, despite attempts at agrarian reform and modernization at the national level.

27. In the case of weak economic growth, the growth of agricultural production in the countries to the south and east of the Basin will necessarily be sluggish, and the social consequences clearly unfavorable. On the other hand, the expected per capita income gaps between agriculture and the other sectors should not widen, which could have a stabilizing effect on the rate of rural exodus. The agricultural population, increasing at a rate close to that of overall population growth, will exert increasing direct pressure on marginal land.

28. The pressure on natural resources caused by fast economic growth, neglectful of the environment, will be very different. In the countries to the south and east of the Basin, agricultural production will grow faster, possibly on account of output from large farms linked to irrigation districts, in turn constantly expanding therefore requiring

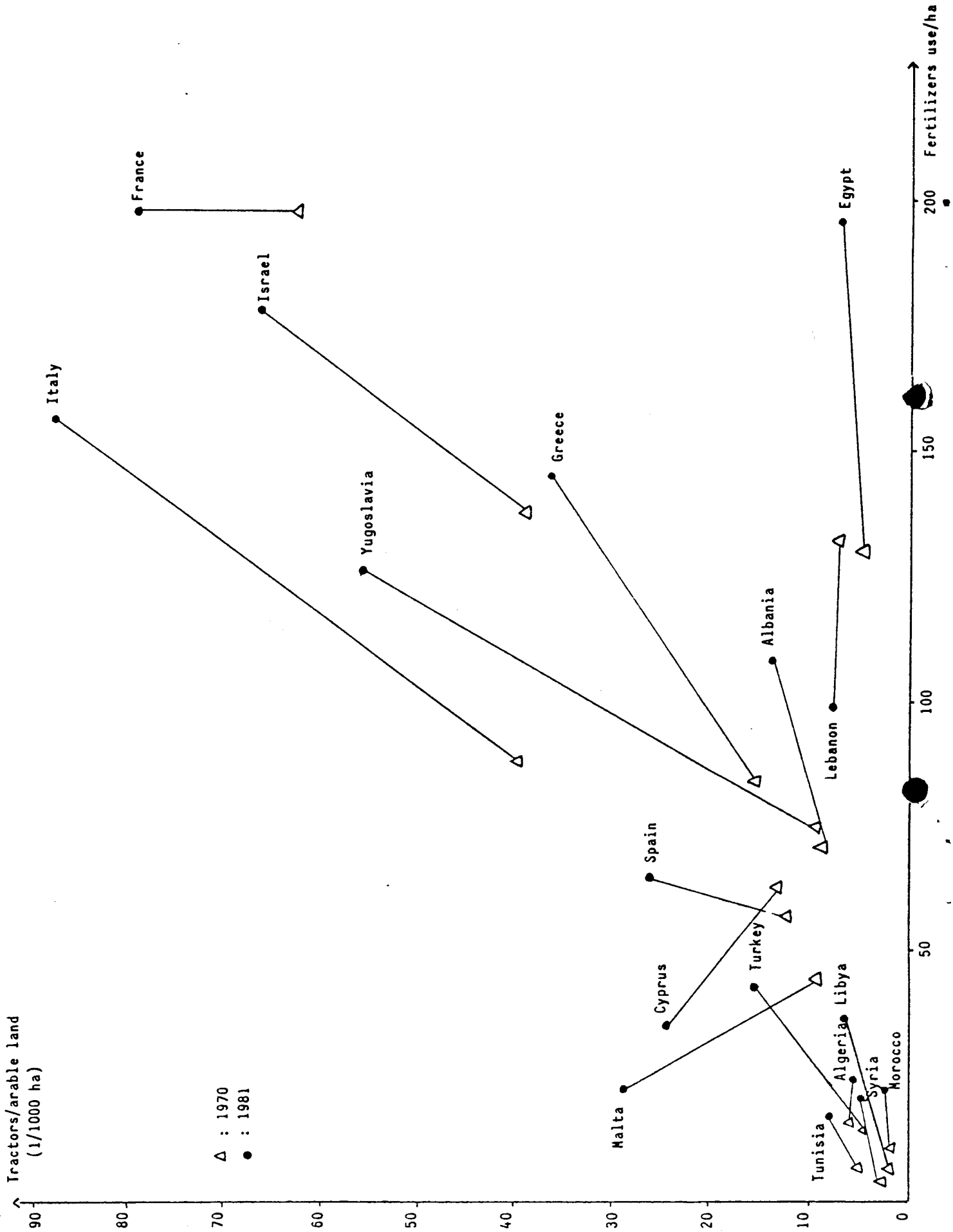
heavy investment. Whatever the number of jobs created by these modern mechanized enterprises (in fact providing little employment), the rural exodus can only speed up, fuelling the kind of urbanization that is difficult to manage. The most disturbing aspect, however, is that this kind of growth, which retains few people on the land, will in addition be wasteful with natural resources and comparatively polluting. In fact a large amount of water will be consumed for agricultural use, accompanied by the massive use of fertilizers and pesticides. Soil will be very sensitive to the techniques used, and in any event pressure will grow on the coast. Efforts to increase agricultural production could moreover be limited by the availability of water and land, as well as the capacity of industrial suppliers to produce other inputs such as tractors and fertilizers.

29. Among the environmental consequences of increased fertilizer and pesticide consumption (factors of 5 to 6 or 8 depending on the case) and of irrigation are :

- the risk of salinization (the surface area thus lost will have to be deducted from the areas gained) ;
- the risk of food poisoning and loss of drinking water (pollution of groundwater or stocks by nitrogen and phosphorus, the heavy metals usually accompanying the latter, and by pesticides which follow particularly complex migration paths, and some of which accumulate in living tissue) ;
- the impoverishment of fauna and flora ; already only 10 % of the traditional domesticated species known in the Mediterranean a century ago remain today ;
- the risk of growing soil erosion by wind and water, etc.

30. In the case of more sustained economic growth, but considerate of the environment and resources, and mindful of the long-term agricultural prospects, the resources in water and agricultural land of the southern and eastern countries will necessarily be employed, but resource-saving technologies would limit the amount used. This kind of development assumes on the one hand efforts in investment, agricultural research and training and, on the other, a price policy which is an integral part of the national development and land use plan. North-South co-operation in research and development could inter alia be directed towards increasing

AGRICULTURE : EVOLUTION OF USES OF INDUSTRIAL INPUTS (1970 - 1981)



yields in the traditional environment, and the optimized use of industrial inputs.

31. Thus the issues concerning agricultural development are different in the countries to the north of the Basin, where the European Economic Community agricultural surpluses currently prevail, and the countries to the south and east threatened with or suffering from shortages. For the former, the overriding issue is regulation, whereas for the latter, increased production (in unit terms or financially, depending on the possibilities of international trade and the specialization stemming from it) is vital, even if the food deficit cannot be overcome. In the countries to the south and east of the Basin, an increasing amount of artificial elements are likely to be introduced in agriculture, requiring capital and know-how but, depending on technological developments, they could differ in terms of choices made and resources employed. On the one hand the massive and poorly co-ordinated use of industrial inputs (fertilizers, pesticides, machinery) could seriously damage the environment ; on the other hand, a suitably adapted and controlled application, sparing with products but exigent as to knowledge and diversified inputs, could significantly reduce degradation. These two options do not represent an easy alternative, and the latter, favorable to the environment, could only be implemented in the countries to the south and east of the basin within the framework of enlightened international co-operation. These countries are therefore the most exposed to over-exploitation of resources, which may stretch to desertification.

32. In the north it is a matter inter alia of:

- controlling and managing fallow land through various kinds of incentives for farmers and a suitable land-tenure policy, supplemented where necessary by reforestation ;
- avoiding "over irrigation" which wastes water through thoughtless withdrawals and pumpings ;
- avoiding overproduction, which sometimes involves the destruction of surpluses, especially as it pollutes while producing for no useful purpose, only to destroy production ;
- stabilizing the amounts of chemical inputs used, aiming at better control of their use ; the development of technological research could greatly assist this objective.

33. In the south and east the much stronger pressure on more limited resources will affect, in particular :

- water, of which 80 % is currently used for irrigation, for which difficult choices will have to be made : faced with inexorably rising costs, production will have to be directed either towards other sectors or towards high value-added products linked to exports ;
- land, where soil erosion and shrinking plant cover linked to salinization could lead to declining fertility ;
- spatial economics, where urbanization appropriates good agricultural land while the latter extends into more fragile areas ;
- pollution stemming from over-rapid agricultural intensification, where the effluents from "non-soil" production, especially fertilizers and pesticides, are dispersed in a system which is scarcely prepared to receive them.

34. Considering the geographical configuration of the Basin and the location of cities, it is likely that Mediterranean agriculture will tend to concentrate in the large plains and coastal plains, adding to the "artificiality" of agriculture. In the Mediterranean Basin trade in agricultural products, which could amount to 100 million tonnes by 2000, will bring in new industry-port and agro-food infrastructure in the same areas, especially on the coast.

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35. Analysis of the prospects for agriculture highlight the importance which should be given to certain actions, in particular those listed below :

- since agricultural intensification is essential in the south and east of the Basin, care should be taken to avoid intensifying in a haphazard or poorly controlled way, and to aim at well-targeted and properly guided operations, co-ordinating the technological mastery of industrial inputs (mechanization, fertilizers, pesticides, machinery, etc). This will contribute to reducing as much as possible the damaging effect of the large expected increase of these inputs on the environment. In the north, attempts should be made to stabilize the amounts of industrial inputs used in order to achieve better control of their application ;
- in order to avoid soil salinization and waterlogging, the drainage

networks in existing irrigation districts should be maintained and care should be taken to set them up properly in new districts ;

- the development of biotechnologies likely to increase or to improve agricultural production (nitrogen fixation, crop protection, etc) should be promoted in the region ;

- the conservation of cultivated plant varieties and domestic animals is essential for the future development in the Mediterranean region ;

- special attention should focus on the use of Mediterranean coastal areas by agriculture and the agro-food industries which stem from it.

36. As regards living marine resources, the requirements of the Mediterranean population in fishery products are high (in the order of 4 million tonnes per year) and change continuously in favour of better quality species (sea perch, gilt-head bream, etc.). Compared to these needs, current Mediterranean production is very low, at a ceiling of around one million tonnes per year since the beginning of the eighties.

According to the trend scenarios, the development of living marine resources and their use without major constraint would continue more or less in the present way. A relative increase in catch tonnages could be foreseen in the short- and medium-term, which could peak, then decrease through the over-exploitation of stocks and deterioration of the environment through pollution. With a better balanced kind of development, and more effective collaboration among the coastal countries, it would be possible to adapt catches to better assessed fish stocks.

37. Aquaculture could also be developed (27,000 tonnes in 1987, 44,000 foreseen in 1992) ; more than 1 million hectares of coastal zones could be devoted to this activity, including a number of very productive briny lagoons, which could be developed. The actions under way within the framework of the Mediterranean Action Plan should be actively pursued.

IV. PROSPECTS FOR THE INDUSTRIAL SECTOR

38. Whereas around 1950 the Mediterranean coastal countries accounted for a percentage of world industrial production lower than that in 1929, and the decline of the Mediterranean Basin seemed to be definitive, after 1950 these countries experienced higher than world-average growth,

and some of them even had "spectacular" growth. There was a strong imbalance, however, in the value added of manufacturing industries in the Mediterranean basin (more than 200,000 million dollars in 1983) between the northern side (about 90 %) and the southern side (about 10 %), although these percentages would change substantially if only strictly Mediterranean regions in the north were considered (about 80 % and 20 % respectively).

39. Among the major trends influencing industrial development are :

- for the north : the peaking in some countries, the decline in others, of traditional industries such as steel, cement, and oil refining, followed perhaps by part of the inorganic chemicals and aluminium industries, and the emergence of new highly automated industries, greater use of robotics (itself a new industry) and new, technological processes, including biotechnology. The development of these industries will depend partly on interactions between Europe, the United States and Japan, and will therefore be faster in the case of stronger international co-operation. Drawing largely on the tertiary sector, many of these industries could in addition be established on the Mediterranean coast (projects for a "Californian Andalusia" or a Mediterranean Silicon Valley).

- for the south and east : population growth will entail considerable demand for traditional manufactured goods, and basic industries such as steel and cement should continue to grow.

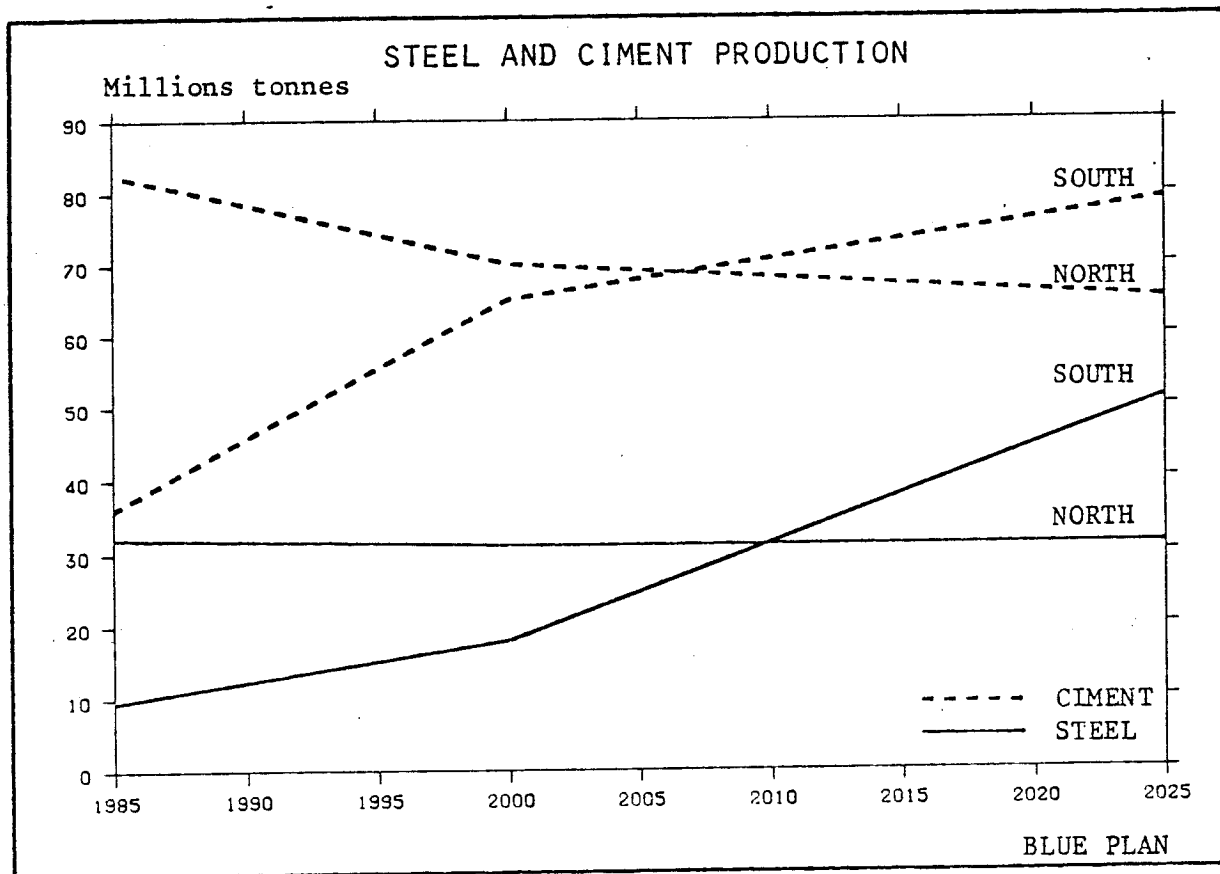
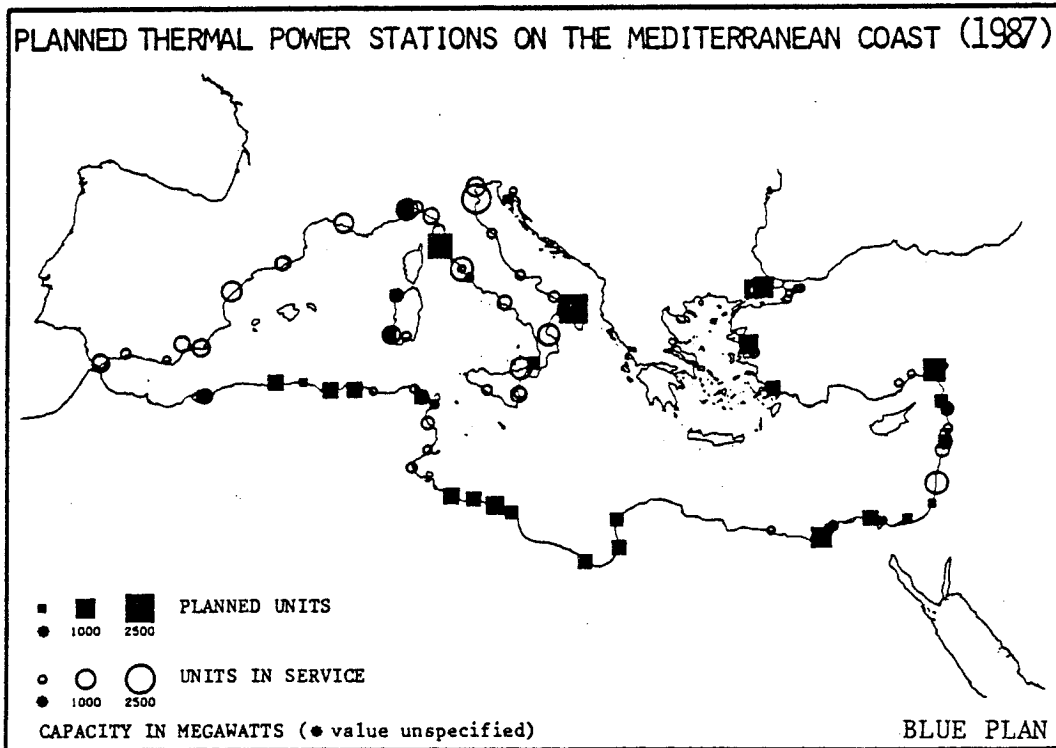
- the most favorable kind of development for the southern and eastern countries would be an industrial development based both on the growth of the domestic market -which assumes strong agricultural growth- and broad access to the European market. Co-operation agreements along these lines would bring about the growth, not only of light industry, but also of other industries, particularly those concerned with the initial transformation of products : metallurgy, petrochemicals, and all heavy industry. However, these first transformation are the most polluting ones, along with perhaps food and agriculture. North-South economic co-operation mindful of the environment, such as envisaged for this kind of development, should therefore ensure that the transfer of northern markets to the advantage of the south does not imply a transfer of pollution. This transfer should, on the contrary, offer an opportunity to gear technological development towards less polluting processes. The

best prospects for development could be in the countries which manage to achieve a balance between the growth of major industries based on modern non-(or less) polluting industries, stemming from co-operation framework agreements, and of small- and medium-sized firms deriving from the internal vitality of society.

40. The range of possible industrial development is considerably broader in the south than in the north (where the scenarios in fact vary comparatively little). The southern countries could maintain considerably higher industrial growth rates over the long run, although stagnation cannot be ruled out.

41. At the origin, industrial pollution comes largely from a small number of plants whose future location cannot be accurately determined. Pollution control could be carried out by resorting to new processes (often reflecting the kind of development concerned for the environment) or to depollution procedures (decided by "polluter pays" type of policy). Studies show that often existing anti-pollution techniques are not fully used in the Mediterranean Basin. An informal sector of varying importance according to the country and industrial branch also exists, which deserves special attention. It contributes to development through employment generation. On the other hand, it presents very specific pollution problems and usually eludes environmental protection regulations.

In the industrialized countries to the north of the Basin, "ordinary" pollution produced by the traditional industries has no doubt peaked, and will be continuously better controlled and reduced, provided however that public authorities impose increasingly strict standards, ensure that they are respected, and that the corresponding investments are made. On the contrary, the risk of "extraordinary", accidental pollution will probably increase in many old or new industries : fine metallurgy, fine chemicals, biotechnology, electronics, etc. In the less industrialized countries to the south and east of the Basin, where production capacity will in some cases considerably increase, the matter of investment for pollution control will be fundamental. Some choices will be facilitated by the competitiveness of new processes more favorable to the environment, such as steel processing with natural



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gas. North-South co-operation could also play a useful role in this respect.

A large number of industrial plants are already located on the coast ; this trend will grow. It is moreover only one of the aspects of relationships between industrialization and land use, because land indirectly "consumed" by induced urbanization, transport, utility (water, energy, etc.) and communication infrastructure, etc. has to be added to land directly consumed by industrial installations.

42. Mining depends heavily on world market trends, affected by slackening needs for raw materials. Open-cast mining will no doubt continue to progress (mechanization), but the impact on the environment is serious : degradation of sites, dust emissions, etc. Biotechnologies should develop for the post-extraction treatment of ores, although it is as yet impossible to reach a conclusion on the possible effects of induced biological pollution.

43. Between 1985 and 2025, the iron and steel industry is likely to stagnate in the North at a little over 30 million tonnes (decline in Spain, France and Italy being just compensated by increases in Greece and Yugoslavia). The south and east (from Morocco to Turkey) should exceed northern output after 2000, reaching at least 50 million tonnes or slightly more in 2025 in the strong-growth types of development. Control of pollution in the traditional iron and steel industry is possible, but at relatively high cost (20 % to 25 % of overall investment). But after a period of comparative immobility in production lines, it seems that the medium-term trend is towards a real transformation of the iron and steel industry, with the use of natural gas (for which the countries in the south of the Mediterranean are in a particularly good position) and the direct ore reduction process. Impact on the environment would lessen, although some sources of pollution would remain, as there would not necessarily be a parallel adaptation in downstream operations. In any event, the iron and steel industry would continue to be located preferably on the coast, waiting perhaps in the longer run for a bacteria-based bio-steel industry using solar energy, certainly less polluting than the current processes, and for which the Mediterranean Basin would be in a good position.

44. Similarly to iron and steel output, northern countries' cement production (90 million tonnes, at most) would be exceeded after 2000 by that of the countries in the south and east of the Basin (more than a total of 100 million tonnes in 2025 in an average scenario). No technological innovation is expected here, since cement is a very inexpensive product which uses abundant and cheap raw materials. The very heavy dust emissions of cement works can, however, be reduced from more than 3 kg/tonne cement to less than 0.5 kg. tonne with anti-pollution devices.

45. As regards petrochemicals' capacity should change little in the north. In the long run, capacity in the south and east should, in this case too, exceed that of the north, and would mostly be situated on the Mediterranean coast. The heavy chemicals industry produces a large volume of waste, which can be controlled by anti-pollution devices ; the fine chemicals industry creates less, but sometimes very toxic, waste, and the risk of accidental pollution may arise. In both the south and north pollution caused by used non-biodegradable plastic materials, scarcely thermodegradable at low temperature, is likely to cause difficulties.

46. Concerning finally inorganic chemicals, various hypotheses about development in the agro-food industries indicate that fertilizer needs in countries to the south and east of the Basin will be considerable, and fertilizers represent the largest part (in tonnage) of the inorganic chemicals sector. Ammonia production capacity on the southern and eastern side of the basin (3.5 million t/year) already exceeds that of the northern side and should continue to grow. Without expecting any significant technological change, pollution control is possible in any fertilizer industry, and will be more so in the future, depending on the resources allotted to it. The real turning-point would be the direct fixation of nitrogen by bacteria, which would imply a re-assessment of the nitrogen fertilizer industry (but not necessarily that of potassium and phosphate fertilizers).

47. In any event, it is essential to increase national and regional incentives for the application of existing industrial anti-pollution techniques and to improve training in this respect, as well as relations between industrialists and local authorities. On account of the significant development of traditional industries expected in the south and east of the Basin, there is a strong likelihood that the situation as regards pollution in these regions will deteriorate. The countries concerned could, however, offset this risk with financial incentives (though expensive in some sectors), and the implementation of a careful location and installation policy (industrial zones with facilities for effluent collection and treatment, etc), avoiding the most sensitive parts of the coast.

V. ENERGY

48. In the countries to the north of the Mediterranean Basin, energy consumption has tended on the whole to stabilize, decreasing in some countries as a result of very serious energy-saving efforts. In the other countries it has risen slowly, and will probably stabilize there too in the end. This relative stability in consumption limits to some extent the options for future supply, especially when major capital investment programmes have been launched and will continue until the end of the nineties (the case of some nuclear programmes).

The situation is quite different for the countries to the south and east of the Basin, where needs are considerable and where also the principal Mediterranean hydrocarbon deposits are located.

49. Most countries, because they are either importers or exporters, depend heavily on the international context for the development of their energy sector (in turn conditioned by, and conditioning, industrial development), and specifically on the market trends of the main fuels : oil, coal, gas, uranium.

Depending on the various kinds of development envisaged, total commercial energy consumption in the Mediterranean countries could lie between 1 000 million tonnes oil equivalent (t.o.e) in 2025 in the case of slow economic strong growth, compared to 480 million t.o.e. in 1983.

Consumption would tend to be evenly distributed between the north (from Spain to Greece) and the south and east, instead of 87 % for the north and 13 % for the south and east in 1983.

50. Whatever kind of development occurs, it is likely that electrification will continue to grow fast in the southern and eastern countries, starting in the rural areas with lighting and television, also keeping pace with urbanization and industrialization. In the south, electricity consumption could grow from 80 000 million Kwh (80 TWh in 1983 to 900 or more than 1000 TWh in 2025. Whatever kind of production is used, it is likely that most of the 150 or 200 thermal power stations to be built (depending on their size) will be on the Mediterranean coast, since some 140,000 million m³ of cooling water are required annually, of which a little more than 1,000 million m³ will evaporate. Up to 2000, the power stations in countries in the south and east of the Basin could run on natural gas (a comparatively exceptional case), fuel oil, and no doubt increasingly on imported coal, for which all the necessary reception facilities would have to be located on the coast. Beyond 2000, and assuming a recovery in orders for nuclear power stations in general throughout the world, and in particular in the countries on the northern side of the basin, this option will also be open to southern and eastern countries.

51. From the viewpoint of impact on the environment, it is likely that the safety features of nuclear power stations will have further improved, and that the storage of radioactive waste will have become a commercial undertaking. As regards coal-fired power stations, currently one of the main sources of SO₂ and NO_x emissions, new combustion processes either after gasification or using fluidized beds, without mentioning the numerous processes already known for the desulfurization of combustion fumes, are likely to have been marketed by the end of the century. This trend partly detracts from the relevance of calculations on atmospheric pollution based on current processes (between 12.5 Mt and 25 Mt of SO₂, 3-6 Mt of NO_x, 900-1,800 tonnes of dust, etc. for the whole of the basin in 2025). Nevertheless, the basic choice between coal and nuclear will have to be made towards 2000.

52. Oil consumption should stabilize or even fall in the north, but continue to rise in the south and east until it slightly exceeds that of the north (a total of 325 Mt in 2025). Between 1985 and 2025 the total consumption of the Mediterranean countries would exceed 12,000 million tonnes, i.e. more than twice the current known reserves in the region. This means that new reserves would have to be discovered, and that the gap would have to be met with imports, a common situation for the countries in the north, but a new one for some in the south which, currently oil-producers, will in turn become importers.

53. Will the new oil reserves come from the Mediterranean Sea itself? Off-shore prospection (some 20 platforms in operation and some 100 concession-holders) have not so far produced remarkable results: production is in the order of 5 million tonnes. Any scenario in this field is naturally subject to geological unpredictability, but no case has been foreseen in which the Mediterranean will develop large-scale off-shore activities, with the environmental hazards involved. Other environmental aspects related to oil in the Mediterranean are, on the one hand, refining and, on the other, maritime transport. Refining operations, located mainly on the coast, are likely to continue to shrink in the north and increase in the south and east.

54. One unknown factor of future energy development is linked to the potential of natural gas, whose known reserves increase steadily at world level -they are already large in the Mediterranean Basin- and whose advantages with respect to the environment are considerable. Important technological progress under way (deep drilling for example) could further increase its availability. Assuming a development based on co-operation and care for the environment, it would play a major role in increasing South-South and South-North energy trade (through an increase in the number of trans-Mediterranean pipelines through the Strait of Sicily or the Strait of Gibraltar rather than by methane tanker transport). Thus, natural gas consumption is all the more likely to increase as it would find new applications (electricity, motor fuel, etc).

55. Assuming a development neglectful of the environment, renewable sources of energy will not be promoted. These forms of energy require

however the launching of more active North-South technical co-operation programmes. In the context of goal-oriented programmes for developing these forms of energy, decentralized conversion of solar energy (into thermal and electrical energy) would spread in the rural areas and isolated regions where it would help to solve the fuelwood problem. Thanks to a breakthrough in photovoltaic cell technology, solar energy could also make an increasing contribute to the grouped production of electricity, for which countries in the south and east of the Basin would be in a particularly good position. Finally, aeolian energy could be used for the same purpose, especially in the Mediterranean islands and on some parts of the coast.

56. The climatic impact of energy use could be local (changes in micro-climates, "smogs"), regional (acid rain, thermal waste), or global (the "greenhouse effect" of exhaust fumes). These impacts -easier to imagine than to quantify- could have often feed-back effects on development in the Mediterranean Basin. Studies in this area are still very fragmentary and conclusions are uncertain. The greenhouse effect could influence rainfall and the regional water cycle, the northward shift of aridness, and forest fires ; possible changes in organic (hence agricultural) productivity and ensuing alterations in ecosystems cannot be ignored. It is for Mediterranean researchers to follow closely work in this field, or to take part in it. The Blue Plan hypotheses have not entirely to discounted a curb on world coal consumption, subsequently, on all fossil fuels, in view of the need to reduce the "greenhouse" effect at the global level.

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57. Future demand is a major factor in the Mediterranean energy sector : resources are subject to heavy constraints related to the international context. The coastal countries do, however, have some options open to them ; exchange of information and practices, and the establishment of suitable policies geared as a priority to energy conservation would help to improve the situation.

In the southern and eastern countries, the search for a solution to the fuelwood problem in rural areas (distribution of LPG, followed by rural,

decentralized electrification) would spare the often overexploited forests.

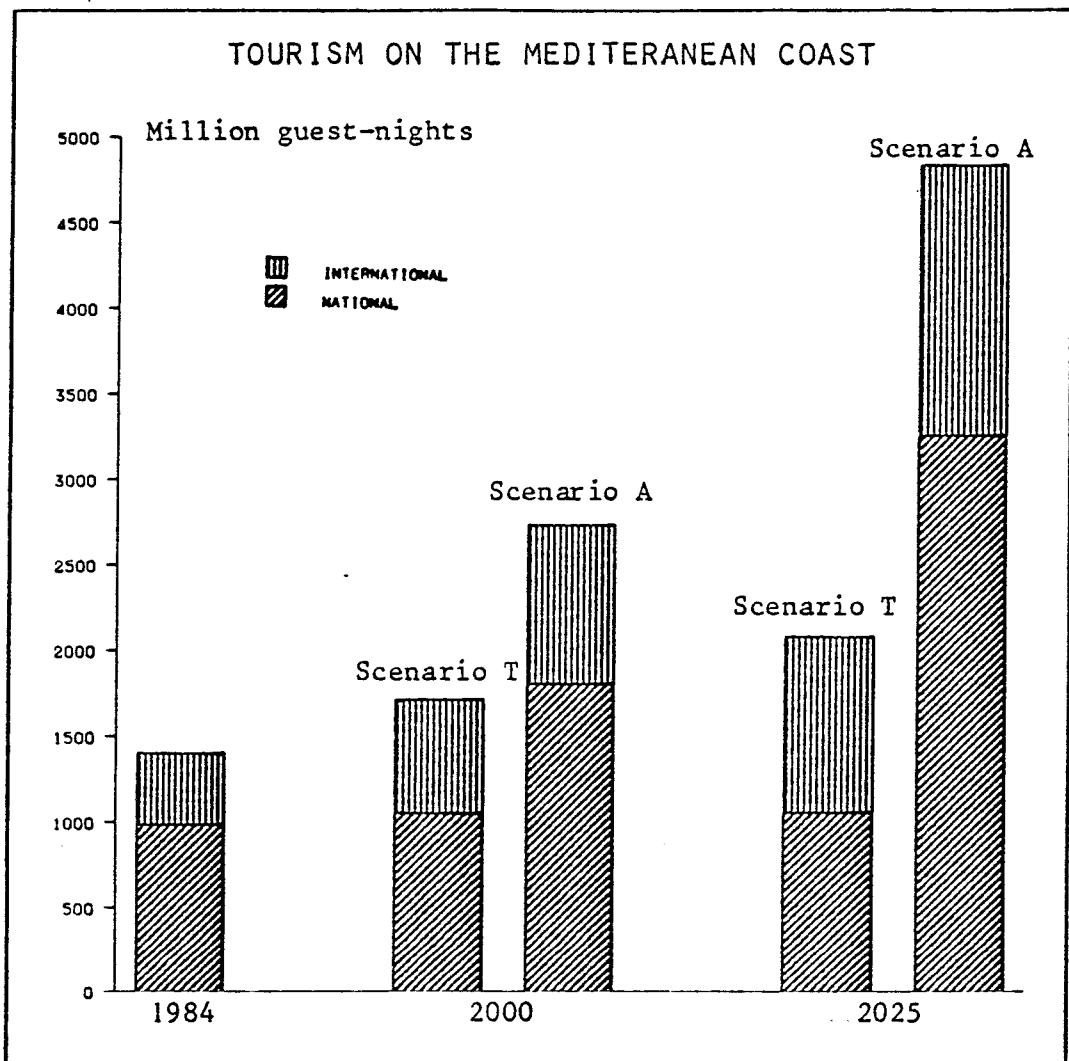
Even in a high rate of growth and penetration, the contribution of solar energy would not be significant in the Mediterranean countries on the short or medium term. In the long term, however, it should acquire a more important place. Through more systematic targeting, solar energy could already make a useful contribution, particularly for irrigation, the rural world and scattered dwellings.

VI. TOURISM

58. Host to some 35 % of international tourism, the Mediterranean Basin is the biggest tourist region in the world. In addition, tourism is undeniably one of the most active sectors in the Basin and seems, to some extent, to be little affected by the slackening of economic growth in the countries of origin. It concerns all Mediterranean countries : it became evident that in fact all the countries have ambitious plans to develop their tourism, international first of all, but also domestic (especially in the countries to the south and east of the Basin where domestic tourism is emerging, usually from a narrow base) ; the total of these plans seems higher than the total flows that could be anticipated at the level of the Basin. Tourism has significant effects on the GDP, employment, and the balance of payments, paying for a considerable share of imports (10-25 % depending on the country, partly compensating the food deficit or covering part of the oil bill).

59. Mediterranean tourism is characterized by three basic features :

- it is heavily and increasingly concentrated on the coast. No Mediterranean country that has attempted to improve tourist distribution throughout its national territory seems to have been successful. In some countries, coastal tourism represents up to 90 % of all tourism. Currently, international and domestic tourists on the Mediterranean coast numbered nearly 100 million, giving a total of some 1,400 million guest-nights ;
- it is heavily seasonal, the high season culminating in two to four weeks of particularly heavy business. This implies a notorious under-exploitation, even "wastage", of tourist lodgings and installations ;



Preliminary results

- host to some 80 % of international tourists, the three countries to the north-west of the Basin (Spain, France and Italy) dominate the tourist market, and will continue to do so, despite comparatively faster growth in the other areas. In these three countries, however, concentration on the coast is considerably less strong than in most of the other countries, except for Egypt in particular. An additional distinctive feature -about which many countries complain- is their lack of direct commercial installations on the large markets of the countries of origin (United States, Northern Europe) where the major international operators predominate (tariffs, transport, planning).

60. On the basis of these major trends, and with growth rates that some professionals may find perhaps too cautious, the most divergent kinds of development would give in 2025 :

- 380 million tourists for the Mediterranean countries as a whole (265 million international and 115 million domestic tourists, of which nearly half on the Mediterranean coast in the case of weak economic growth ;
- 760 million tourists in the case of strong growth (410 million international tourists and 350 million domestic tourists, a true domestic "explosion"), of which nearly 350 million on the Mediterranean coast. The number of guest-nights corresponding to these 760 million tourists would be around 11,000 million. It should be observed that if current lodging capacity were to be used all the year round, 33 million beds would be sufficient to receive them. This gives an idea of the interest in staggering, at least partially, the holiday period.

61. The impact of this kind of tourist development on the Mediterranean environment can first be measured by direct requirements in terms of space. It is estimated that currently site coverage of all tourist lodgings (hotels, rented accommodation, secondary residences, youth hostels, holiday villages, camping and caravan sites, parking lots, etc.) is in the order of 4,400 km², of which some 90 % in the three north-western countries, Spain, France and Italy. This coverage could double by 2000, to reach 8000 km². Solid waste produced by tourists, currently in the order of 2.8 million tonnes per year, would reach between 8-12 million tonnes in 2025, while sewage discharges would rise from 400 million m³ to a figure that could be as high as 1,500 million m³. This means that tourism will contribute significantly to

waste and to water drawoffs in coastal areas, in competition with urban needs, precisely at peak periods.

62. An increasingly serious consequences, which cannot be quantified, is the threat of the rapid degradation -even disappearance of fragile beauty spots and the deterioration of historic sites (Venice, Luxor, etc.) produced by increasingly mass tourism. To save these treasures of mankind, should "nature" or historic parks be constructed to replicate over-famous sites, with full use of new technologies ?

Another quantitative aspect of tourism development is the change in the type of tourist, with a trend towards increasing diversification in the holiday styles offered (sport, cultural and recreational tourism, conference tourism, etc.).

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63. It is possible to receive four times more tourists in the Mediterranean, but it is clear that countries, local authorities and professionals in the tourist sector (who in addition are competing with each other almost everywhere in the Basin) will not be able to acquire control of this growth, without an effort to improve information, analysis and co-operation.

Each country could aim at improving distribution throughout its national territory (distribution of flows to avoid saturation) and throughout the year (partial staggering of holidays, short stays, winter tourism) to relieve pressure, and this could contribute to better integration with local communities.

Finally, raising the awareness of tourists as regards protection of the environment they come to enjoy is an important requirement in all the countries.

VI. TRANSPORT

64. Transport, an activity which derives from the other sectors, is a result of development policies. Its organization, in turn, fosters this development.

The major trends in this sector are :

- the growing mobility of persons, goods and financial resources,
- a comparative decline in physical transport to the benefit of communication and diversification (fall in the share of heavy products),
- changing technology (increasingly automated and computerized land, sea and air vehicles, etc.),
- an increase in combined carriage (road-sea, road-rail, etc.) and the growth of multimode "exchange intersections".
- the fact that the Mediterranean is increasingly becoming a transit area, and that the concept of an "internal sea" is fading.

65. In the maritime area, oil transport (currently around 200 million t/year) is not likely to increase much : intra-Mediterranean traffic between North Africa and southern Europe should peak, then decline. The main traffic would continue to come from the Arabian-Persian Gulf through the Suez Canal, headed partly for the Mediterranean countries but also for countries outside the Mediterranean through the Suez-Gibraltar route. Crude transport should drop, while the transport of products refined by the producer countries should rise, which would change somewhat the transport profile in favour of smaller ships with specialized cargoes (some of which, more polluting or more toxic, increase the risk of major accidents). The most serious aspect for the Mediterranean environment is that discharges from ships at sea will not decrease quickly, because this is linked to renewal of the tanker fleet, which should take at least twenty years. Hence the need to speed up the installation of land facilities in order to comply with the MARPOL 1973/78 obligations concerning disposal of oil in the Mediterranean Sea, which assumes vigorous and immediate action on the part of the states concerned. Although, contrary to oil, use of natural gas is likely to expand vigorously in the case of rather strong economic growth, mobilizing to a maximum all energy resources, and even more so in the case of goal-oriented gas promotion policies, intra-Mediterranean transport of LNG will probably grow very little. On the contrary, there would be an increase in the number of trans-Mediterranean gas pipelines between Algeria and southern Europe through the Strait of Sicily or across the Alboran Sea or the Strait of Gibraltar.

66. As industrialization proceeds in the countries to the south and east of the Basin, and trade grows, there will be an increase in the transport of chemical products, in bulk or packaged, and a parallel increase in the risk of accidental pollution (some of these products being highly toxic). With some 2,000 merchant ships plying the Mediterranean at all times -including 250 to 300 tankers- the frequency of accidents or "events at sea" is currently about 60 a year for the Mediterranean as a whole (collisions, sinkings, strandings, etc.), with a comparative concentration near Gibraltar and in the area situated to the south and east of Greece and south of the Dardanelles.

67. Of all forms of transport, however, road transport is developing most strongly in the Mediterranean Basin, and will continue to do so. The road network of the countries bordering the Mediterranean, a little more than 2 million kilometres long (all roads included) at the beginning of the eighties (of which nearly 75 % in Spain, France and Italy), could reach between 3 million kilometres (in the case of the lowest economic development) and a little more than 3.7 million kilometres (in the case of strong economic growth). Whereas the already large networks would grow little in the countries to the north of the Basin, in the southern and eastern countries they would expand vigorously (both accompanying economic and social development and making it possible), to the extent of catching up with or even exceeding those in the north in 2025 in the strongest growth case. Site coverage associated with these road networks would rise from some 40,000 km² at the beginning of the eighties to 63,000 km² (case of weak economic growth), and even 74,000 km² in 2025 in the case of stronger economic growth. Depending on the case, between 10,000 and 20,000 km² are thus likely to concern strictly Mediterranean regions. Moreover, a large part of this mileage is already installed on the coast itself, and often on the corniche.

68. The Mediterranean countries' automobile stock, nearly 60 million vehicles at the beginning of the eighties (of which more than 80 % in Spain, France and Italy), is likely to double by 2000, and reach nearly 175 million vehicles in 2025 (with little difference between the various development possibilities, the lower rate of motorization in the case of slow economic growth being partly compensated by a higher

population level). At this date, the three north-western countries' stock would represent no more than just under half the total. Polluting vehicle emissions -NOx, DOx, hydrocarbons, carbon monoxide- depend much on the characteristics of the vehicles and conditions of use, and will depend increasingly on the standards be set in the future. Mediterranean cities where the phenomenon of inversion occasionally occurs -Athens, Cairo, Algiers, Rome, etc.- are increasingly affected. Under current standards NOx emissions could peak at 3.6 million tonnes in 2000, (poorly burnt hydrocarbon emissions at 8 million tonnes); they could decrease beyond that, because of regulation, combined with technological progress and the expected reduction in fuel consumption.

69. Finally, air transport should continue to expand. As regards infrastructure, development will take place in particular through the extension of existing airports, some installations being added, inter alia to meet the needs of new tourist areas. The networks will intensify their intra-Mediterranean linkages, especially in the case of development with strong North-South and South-South co-operation (indirect links being replaced by direct ones through international traffic centres).

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70. Mediterranean co-operation in the various forms of transport could help to restore the balance of transport flows and to offset the negative effects of some trends.

At the intra-mediterranean level collaboration could focus on :

- the application of international conventions on the maritime transport of harmful substances ;
- the development of former, more economical links, with direct services between Mediterranean cities.

. At the national level, efforts could be made to :

- install facilities in port complexes to reduce maritime transport nuisances as far as possible.
- Step up the installation of deballasting facilities.

III. EVOLUTION OF THE MEDITERRANEAN ENVIRONMENT

71. Development patterns, through the various sectors of economic activity, exert different kinds of pressure on natural resources and on the environment, depending both on the level of activity and the priority given to the protection of this environment. The components of the environment selected for the prospective exercise are the soil, inland water, forests, the coastline and, naturally, the sea, subject of other Mediterranean Action Plan programmes. The following pages summarize the evolutionary trends of these components, according to the different kinds of development identified. Atmospheric pollution has naturally been estimated wherever necessary (in particular for thermal power stations or automobile traffic, together with its assumed effect on the forest), but climatic changes and the general evolution of the atmosphere and its interactions with the marine environment have not been studied here.

I. SOIL

72. Competition for the use of land is particularly acute on the Mediterranean coast, and has been studied within the context of all its related problems. Attention will first be given to the agricultural use of land.

Soil erosion (especially from runoff water), desertification, and salinization of irrigated land lead to a loss of productive soil, starting with topsoil, naturally the richest in organic matter. In the Mediterranean regions, surfaces "protected" from water and wind erosion by plant cover currently vary according to the country from about 20 % to more than 60 %. However, the extension of "serious" erosion (from 5t/ha/yr to more than 50t/ha/yr) in agricultural and other land (mainly forest and grazing land) is a reality in all the Mediterranean countries (in particular Greece, Turkey, Algeria, Israel, etc.). In 1980, 35 % of arable land in the Mediterranean in fact lost from 5 to 50t/ha/yr, giving an estimated annual loss of "productive" sediment of around 300 million tonnes per year from agricultural land alone (arable land, temporary crops, gardens, vines, fallow, etc.). It should be stressed, moreover, that the annual loss figures conceal the fact that in the Mediterranean climate losses are most often concentrated over a few months, during a period of heavy rainfall, which requires appropriate control methods (steps, terrasses, etc.). Soil erosion

causes the silting up of downstream reservoirs and dams. The life span of these installations, usually estimated at around thirty years, is increasingly likely to be shortened in regions experiencing heavy general soil erosion (Italy, Turkey, Greece, Spain, the Maghreb countries), thus reducing the volume of water reserves in the absence of watershed management. Another effect is that sediment inputs worsen coastal pollution as they provide an ideal medium for numerous organic and inorganic pollutants which contaminate the host environment (river beds, water intake for agriculture and urban supply, deltas, estuaries and coastal zones).

73. As regards irrigation, its negative effects stem from the fact that the soil, potentially fragile and unstable, has a poorly known or limited capacity to absorb the inputs related to agricultural intensification. If this capacity is exceeded, i.e. in the case of inadequate mastery of drainage and irrigation techniques, the phenomena of salinization, waterlogging or alkalization of irrigated land (which may, moreover, occur quickly, in a span of 5-15 years).

The salinization of irrigated Mediterranean land currently exceeds 30 % in some countries (such as Greece, or the Nile Valley in Egypt) and goes up to 50 % in the Euphrates Valley in Syria.

74. The future trends of these factors depend on development patterns, via the interplay of complex linkages between agricultural development and its impact on the soil. The following aspects will be decisive in this respect :

- investment, reflecting both agricultural development policies and social choices,
- options as to farming practices, reflecting production objectives,
- the kind of techniques used (improvement and application).

With respect mainly to the countries in the south and east of the Basin (not excluding the differences between these two regions) :

- economic development with slow growth, accompanied by extensive agriculture up to 2025 will entail a "wastage" of agricultural land. Eroded land could extend to 38 % of the total (compared to 32 % in 1980) and the fertile layer removed could amount up to 250 million

tonnes (compared to 164 million in 1980).

- economic development with strong growth, but unconcerned about conservation will produce an even greater "wastage" of soil and water resources (particularly for the southern countries), and also a squandering of the industrial inputs used for intensifying agricultural production. It could endanger the future of agriculture in some North African or Middle-Eastern countries. Erosion in the south and east of the Basin could amount up to 34 % of land, with up to 190 million tonnes of sediment removed.

- strong conservation-minded economic growth based on Mediterranean co-operation and serious education and guidance efforts, combined with the search for efficiency in farming practices, would result in less pressure on the soil (on account of the abandonment of the most marginal land) linked to effective control of degradation factors. With a more or less stable agricultural area in the south of the Basin, decreasing in the east, eroded soil would be limited to 26 % of land in 2000, and 21 % in 2025 (with 117 million, then 92 million tonnes of sediment coming from agricultural land). The social impact, in particular on employment, would be positive.

75. Soil policy implies continuous action. At the national level, this is based on a space planning policy which avoids soil degradation and conserves the traditional landscapes.

Agricultural intensification should take in account, from the beginning, control techniques for combating potential erosion in the case of dry farming in the Mediterranean climate and salinization in the case of irrigated farming (with improvement and maintenance of adequate drainage networks).

For mountainous regions, countries could give higher priority to soil maintenance by adopting measures to combat overgrazing and deforestation. On the slopes, they could foster the maintenance or repair of the traditional steps and terrasses (stabilizing elements). In the abandoned hinterland in the north, local authorities and forest officials could join forces to ensure suitable management of rural areas, including through preventive afforestation and the timbering of cleared land.

II. INLAND WATER

76. As much as 80 % of water used in some countries is devoted to agricultural development. Water appears as one of the main factors limiting development in the south and east of the Mediterranean Basin, particularly in the 2000-2025 period.

77. In the Mediterranean countries, irrigated areas currently cover more than 16 million hectares and have increased over the last fifteen years at an average rate of 200,000 hectares per year, entailing additional water requirements in the order of 2,000 million m³ per year. Studies show that in whatever kind of development envisaged, in addition to a necessary and particularly difficult choice to be made between agricultural and urban needs, irrigation techniques would have to be improved (in view of a more economical use of water). In some countries recycling, after treatment, of urban sewage or agricultural effluent would also have to be introduced. This will present very difficult investment problems entailing high running-costs, and agriculture will have to change its production structure to some extent to justify high utilization costs. Surface areas under irrigation could possibly be increased in the north (from Spain to Greece) from 3.8 million to 4 million hectares by 2025 (at an estimated cost in the order of US \$70,000 million (1985\$), entailing additional water requirements in the order of 38,000 million to 40,000 m³ per year. To the east and south of the Basin (from Turkey -which has a large potential for increase- to Morocco), the extension of areas under irrigation could be in the order of 7 million hectares (of which 2.5 million in Turkey) up to 2025, at a cost exceeding US \$140,000 million (1985\$) and corresponding to an additional 70,000 million m³ of water per year. In fact, in all cases water needs could and should be reduced by more economical use of water. In the southern and eastern countries, the "reserve" deriving from water-saving measures could exceed 30 %.

78. Between 1985 and 2025, urban water consumption in the countries to the north of the Basin would increase by between 40 % and 60 %, but in the countries to the south and east of the Basin it would be multiplied by a factor of 3.7 to 4. It is clear that whatever the development scenario, the supply of drinking water to urban areas will

be one of the most critical problems, if only because of the level of investment required in these countries.

79. A distinction can be made between the effects of the various kinds of development on the use of water resources :

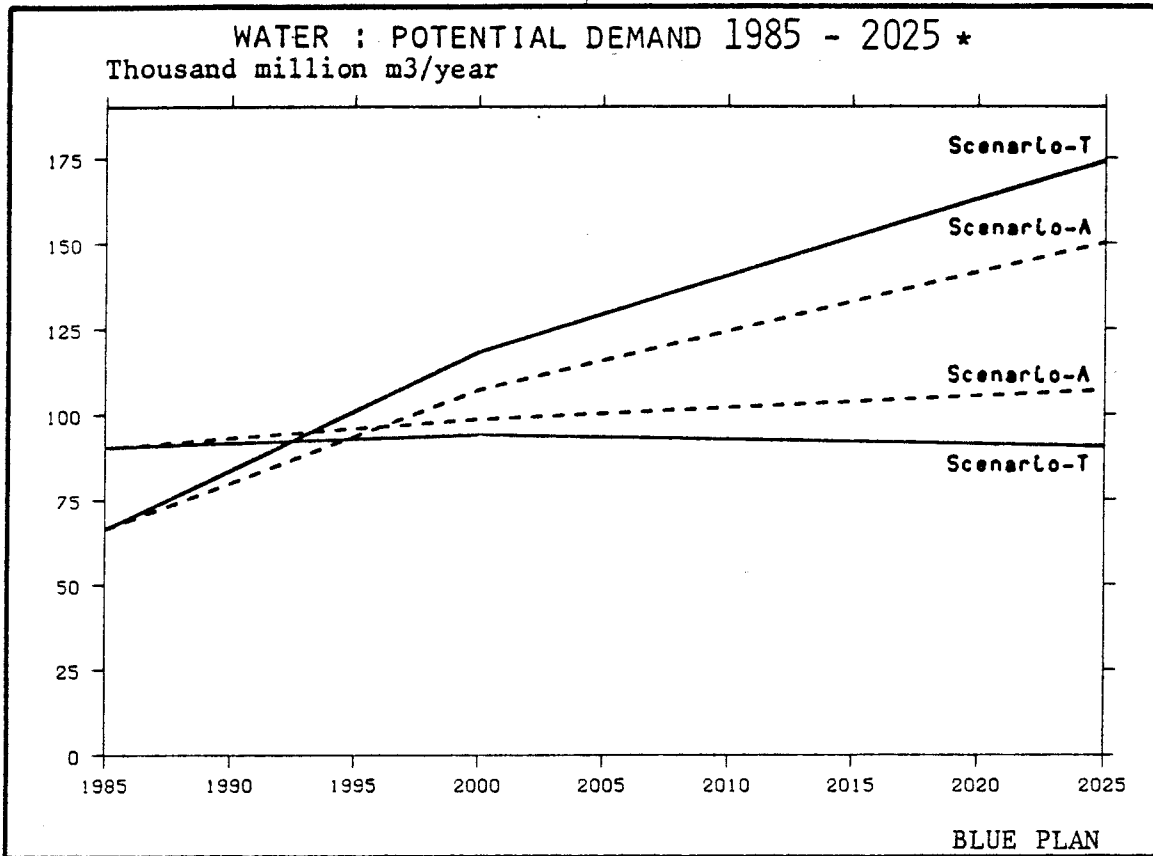
- with slow growth, affecting water through lower demand, but also a delay in installations, the total pressure on water would be weaker and pollution will be concentrated first of all on the urbanized coastline. Choices would be made to the detriment of agriculture and the advantage of cities, which in some countries, however, would not be able to benefit from wide-spread distribution. Water quality would deteriorate and commercial water would be treated in particular, i.e. for consumers able to pay a high price before use.

- with rapid and poorly controlled growth, demand will be much higher and investment would be concentrated on the mobilization of water (at upstream end of the sector), therefore partly to the detriment of the environment. This will entail conflicts as to use, to the benefit of the most dynamic economic sectors. In other words, increasingly higher prices (the water budget could largely exceed one percent of industrial manufacturing costs) could produce a drop in demand in some sectors or for some social groups. Pollution will be fairly heavy downstream.

- with vigorous, conservation-minded growth, in a context of co-operation and special attention to training, uses would be adapted to resources, particularly through the control of wastage, increase in the number of circuits and transfers, and re-use. An effort would also be made to educate the population in this respect, by raising awareness of the cultural value of water. The outcome would naturally be more favourable for the environment, and the overall quality of water would be better, although at the cost of rather expensive downstream treatment.

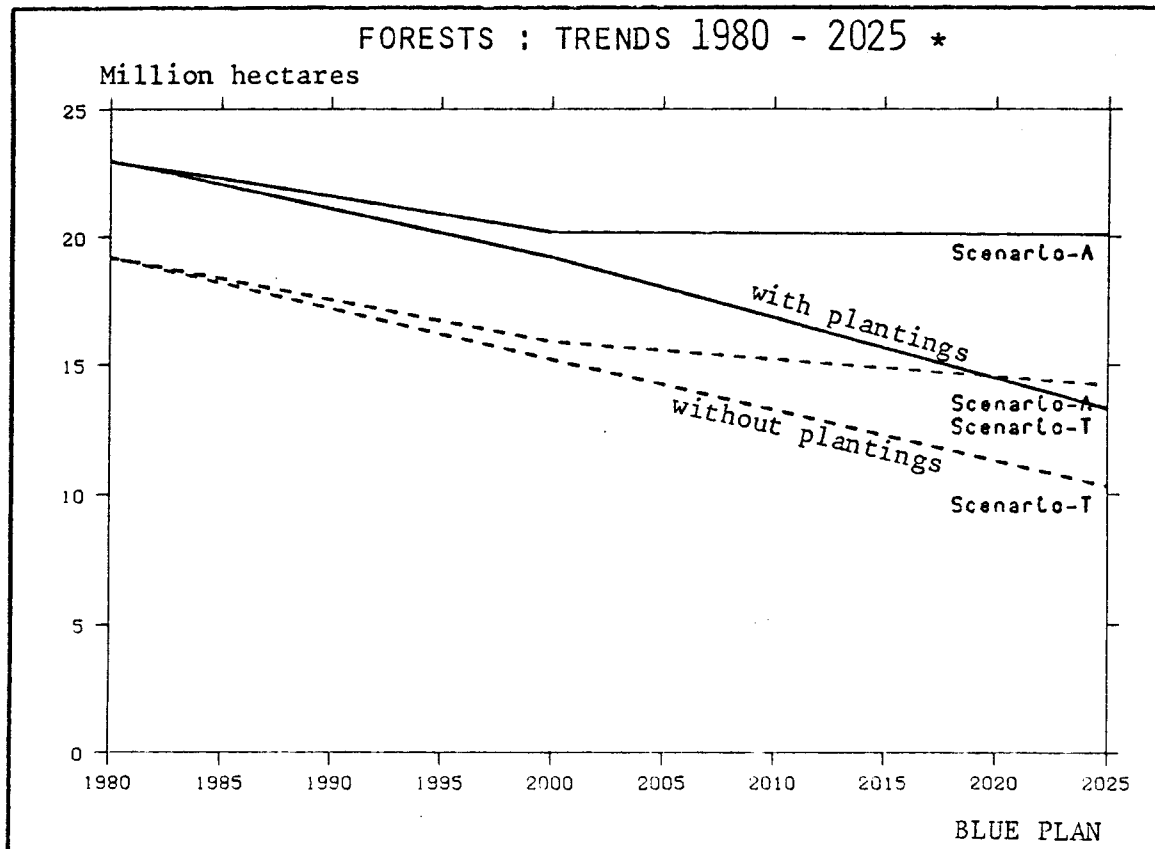
80. In addition to these sectoral estimates of water requirements, an overall prospective study was undertaken at the level of the Mediterranean regions of the Basin countries, and focuses on future drawoffs as compared to available resources. This study led to a division of the countries bordering the Mediterranean into three groups:

- the countries where water availability will remain considerable up to 2025 and beyond, and where there is even a fairly comfortable margin for



* In the Mediterranean watershed

Preliminary results



* In 4 Mediterranean countries
(Spain, Greece, Tunisia, Algeria)

Preliminary results

increased per capita drawoffs. This group of countries includes countries with low population growth (France, Italy, Yugoslavia) and countries with stronger population growth (Albania, Turkey, Lebanon). Maintaining this margin will require efforts to develop and manage water, and also to preserve quality ;

- countries where water availability, although still adequate today, will drop considerably, inter-alia on account of strong population growth (Morocco, Algeria, and also Spain and Cyprus). The global demand for water could, in principle, be met up to 2025 with new water-resource development or major interregional water transfers (costly in terms of energy consumption, especially in the case of uneven relief), on the condition that per capita demand does not increase too much compared to current levels. Countries where per capita demand increases substantially would then, before 2025, fall into the next category :

- countries where current availability is already limited or negligible. As from 2000, resource exploitation indexes exceed or will exceed 100 %, i.e. stable resources are (or will be) used more than once or supplemented with non-conventional resources (fossil water, desalination, etc.). There are six such countries in the Mediterranean basin (i.e. one country out of three), and include both countries with low population growth (Malta), average growth (Israel, Tunisia), and high growth (Egypt, Syria, Libya).

Aside from resorting to usually expensive non-conventional resources, or to imports (projects exist for importing by ship, which will not go beyond possible cases of temporary crisis), a number of countries would therefore have to reduce per capita consumption by proceeding with probably difficult choices, for example between agricultural and urban requirements, taking care to establish a suitable price policy.

81. Despite inevitable limitations and constraints, national water policies could bear fruit. Among priority actions are :

- maintenance, at the national level, of continuous monitoring of the quality of river water flowing into the Mediterranean ;
- development of the integrated management of water basins (combining soil conservation, forest protection, etc), by promoting, as a priority, water conservation and recycling. Establishment of the necessary institutions to ensure such management (e.g. basin

authorities agencies, etc.) ;

- improvement of the technical aspects of irrigation (geared to water-saving), particularly in the south and east where resources are scarce ;
- development of the treatment and recycling of urban and industrial effluent for agricultural use.

III. FORESTS

82. The most important role of the Mediterranean forest is to protect the soil, increase and stabilize water resources and to conserve endemic plant and animal species. The next half-century will be decisive for the maintenance, protection or survival of some forests, subject to formidable pressure, particularly in North Africa and the east of the Basin. The evolution of the Mediterranean forest tends towards degraded forms on account of the pressure (overgrazing, excessive removal of fuelwood, fires, clearing, disease, etc.) being exerted on the various kinds of forest formations (closed, open, fallow, bushes). To combat these trends, protective (management) or rehabilitation (retimbering, planting) action will have to be taken.

83. Among the factors linking development patterns to forest evolution, are :

- forest management and development policies ;
- development of agriculture and stock farming (inter alia in ranges and forests) ;
- the varying density of the rural population (with an impact, inter alia, on fuelwood needs, linked to the next factor) ;
- a country's energy policy and resources ;
- the number of tourists and the mobility of the population (which affects fire risk) ;
- some technological features of industrial development (demand for materials, but also pollution and induced forest "diseases" ;
- infrastructure requirements, in particular transport (land clearing, savage felling) ; etc.

84. Currently, the main pressures in the south and east of the Basin come from overgrazing and excessive removal of fuelwood, while fires are increasingly prevalent and disease is not negligible. The main pressure

in the north is from fires, more or less related to excessive numbers of tourists or to leisure activities, and abandonment by the rural population (lack of upkeep and supervision of groves). In the parts closest to heavy industrial concentrations, or intense automobile traffic, the phenomena of tree degradation associated with acid rain are appearing (similar to those affecting northern Europe). It must regrettably be observed that these tree diseases (whose mechanisms are still poorly understood) are growing in both extent and gravity in the Mediterranean countries. This threat could become a major one in the years to come.

85. If these trends continue, current or envisaged reforestation or planting policies will be very insufficient :

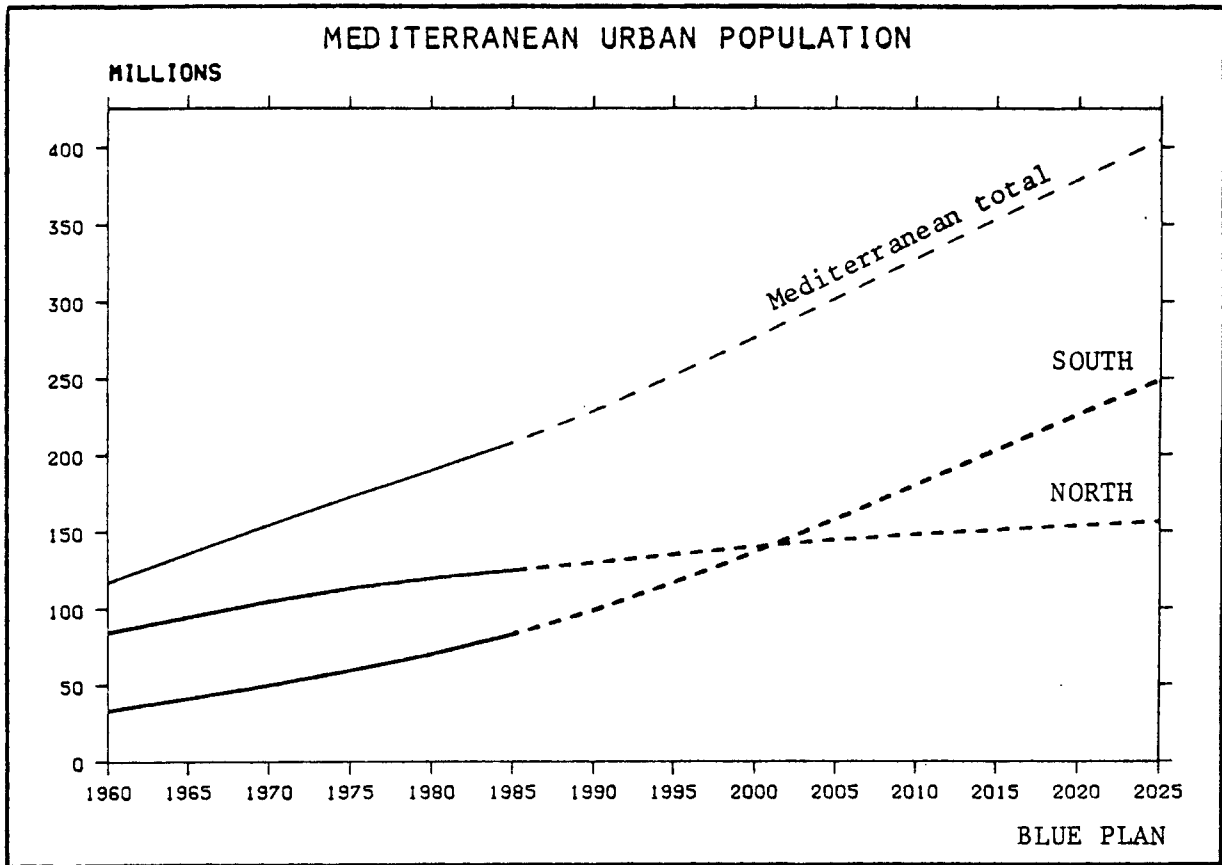
- In the southern and eastern countries Mediterranean forest formations will be reduced by a quarter, even a half, in the worst case, by 2025. In Tunisia, for example, all unmanaged forest will disappear.

- In the countries to the north of the Basin, Mediterranean forests suffer to such an extent from fires that plantings are already insufficient to compensate for losses, whereas agricultural fallow land is growing.

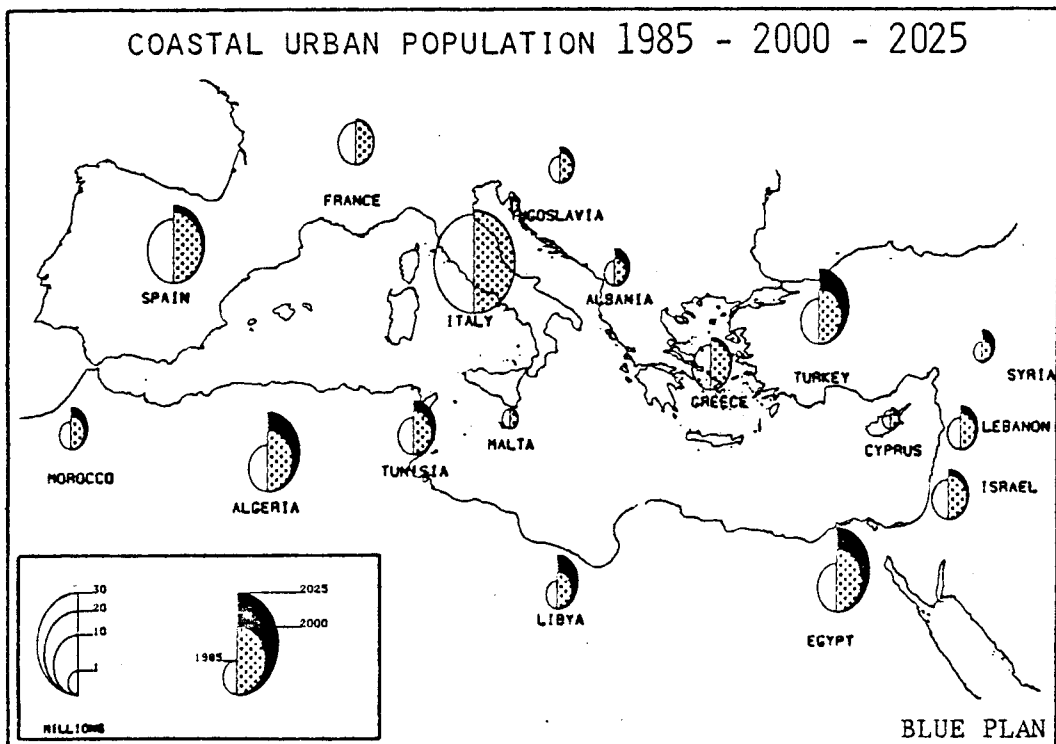
Even with kinds of development that are more concerned with conservation in general, and with protecting the forest capital in particular, a halt to the decline would not be observed either in the north or the south and east until some twenty years after the introduction of relevant policies, i.e. after 2000.

86. Forest protection can facilitate conservation of the genetic heritage of the particularly rich Mediterranean flora. Activities pertaining to the forest will have an even more lasting effect because the corresponding strategy will be established over the long term, avoiding for example the planting of foreign species where endemic ones are economically viable. Both in the north and the south, action could focus on the establishment of protected areas of endemic species and of appropriately managed and protected conservation areas. Species banks and reserves could be useful among Mediterranean countries.

In the countries to the north of the Basin, lasting protection of the forest, beyond fire control, would be achieved by way of the study of



Preliminary results



Preliminary results

diseases and of the prospects for autochthonous species. Care must also be taken as to the way in which production, leisure and landscape protection functions will be incorporated.

In the south and east, officials would benefit by encouraging new forms of co-operation with local populations to protect the endemic forest against overgrazing. "Biosphere reserves" could make interesting "pilot" projects in this respect.

IV. THE COASTLINE

87. The total length of the Mediterranean coastline is estimated at 46,000 km. The coast from Spain to Turkey inclusive, some of it very indented and including numerous islands, totals nearly 3,400 km. The development potential of these often rocky coasts vary. The "flat", useful coast corresponds to only about 40 % of the total and, for the southern countries (from Morocco to Syria) to about 4,000 km. Thus all the developments reviewed in the previous sections for the countries will be concentrated on these 4,000 km.

88. For the coastal countries as a whole, the total population of coastal regions was 133 million in 1985, including an urban population of 82 million. The population of coastal areas should reach between 200 million and 220 million in 2025 (an increase of 50 % to 65 %), with an urban population between 150 million and 175 million. These figures give an idea of the dual phenomenon of urbanization and coastal concentration under way in the Mediterranean basin. Taking the highest figures, 120 million of the 220 million inhabitants on the coast (or 90 million of the 175 million coastal city-dwellers) will be in the countries to the east and south of the Basin.

In addition to the pressure of population and urbanization, the pressure exerted by all kinds of activity has to be considered :

- tourism, whose concentration on the coast is virtually unavoidable ;
- industry and energy, most of which is already installed on the coast, and will increasingly be located there ;
- 58 main loading and unloading oil ports ;
- 50 refineries, plus 11 in the planning stage (in the southern and eastern countries alone) ;

- 62 thermal power stations and 32 in the planning stage, without counting all those that will be required by 2025 (100 or 150 on the southern and eastern side of the Basin alone).

In other words, already 170 major installations and 43 in the planning stage, excluding cement plants, steel works, fertilizer plants, etc. ;

- fisheries and aquaculture (possibly 1 million hectares) ;
- specialized ports for coal, cereals, etc., together with related industries ;
- etc.

89. The natural areas, either wild or still intact, are likely to shrink whereas they should be extended ; the 63 specially protected zones currently registered (natural or regional parks, nature reserves, etc.) are not everywhere as protected as they should be and require the vigilance of authorities and public opinion. It would help to link the officials responsible for them through a "network". Among the specially fragile zones are in particular, the wetlands and most of the areas suitable for aquaculture.

90. One of the major conclusions of the scenarios is that all these activities will exert considerable pressure on the Mediterranean coast, on the countryside, the origin of its cultural and tourist reputation, and especially on the near-shore marine zones, which are particularly threatened, all the more so because they are the most fragile but also the most important as regards living marine resources. In addition to degradation caused by this physical pressure, there is, of course, all the pollution emitted in the Mediterranean coastal zone, but no doubt physical pressure is a greater threat.

Particularly strong policies are required from states, regions, and local authorities in order to achieve effective protection ; integrated planning, for which the scenario method would be very useful for short-, medium- and, more particularly, long-term development, seems essential.

91. States already intervene in many and varied ways to reduce pressure on the coast, which would all have to be mobilized to meet one of major problems of the next forty years :

- registration of the coastal areas most threatened by future development, and preparation of the corresponding impact studies ;
- attempts to reduce to a minimum impingement of coastal development projects on the near-shore marine areas, and to protect marine species in their larval and young stage by prohibiting certain kinds of fishing in some coastal zones ;
- establishment of national institution able to ensure the conservation of coastal ecosystems and landscapes ;
- establishment of integrated medium- and long-term land-use planning for all coastal activities, together with the necessary means of implementation (land-tenure agencies, identification of areas in which construction is prohibited, industrial agencies, inspection teams, etc.)
- search for a better linkage or co-ordination between the evolution of the coast and that of the hinterland (in view of a certain degree of decongestion on the coast).
- co-operation for the combined use of computerized geographical data and prospective studies for integrated coastal development ;

XI. THE SEA

92. Since pollution of the high seas is studied especially by the MEDPOL programme within the framework of MAP, the Blue Plan concentrated more on the interactions between the coastline and the coastal sea. In any event, the scenarios confirmed the close links between, on the one hand, the state of the Mediterranean Sea, and the development of coastal regions and Mediterranean watersheds and, on the other, national development strategies and environment policies at the level of the whole country. It was possible, in a number of cases, to assess the negative effects of environmental degradation on development, which cause marine pollution : productivity decline in the agricultural sector due to erosion and salinity can lead to excessive use of chemical inputs : these inputs filter through the water system and finally end up in the sea in increasingly large quantities. The relationships between economic activities and the state of the sea should also be studied more thoroughly by way of atmospheric pollution, but in the current state of

knowledge environmental meteorology, in this respect, provides assessments that are too superficial for a prospective study.

93. Whether accompanied by slow or fast growth, the kinds of development that neglect the environment lead to a direct and indirect worsening of the state of the Mediterranean Sea. Either economic growth is comparatively weak, but with stronger population pressure which reaches its maximum, or economic growth is strong but with insufficient attention to protection of the Mediterranean environment. The kinds of development concerned about the environment correct or even reverse these trends, but sometimes at a high cost, justified by the gravity of these threats and the realization of their gravity. Efforts undertaken to combat urban and industrial pollution start to bear fruit in some countries, but are still uneven.

94. In the case of well balanced growth (with 150 million inhabitants on the coast in 2025) the rate of connection to urban sewage systems would be in the order of 80 % in the countries to the north of the Basin, and 70 % on average in the countries to the south and east. In the case of slow growth, the rate of connection in the southern and eastern countries would not exceed 45 % on average. The volume of waste would be larger in the case of controlled growth, but domestic pollution would be from 20 % to 30 % lower (more connections, but also more treatment).

95. The strong growth of fertilizer consumption is likely to lead to a big increase in discharges of nitrogen and phosphorus into the sea : a factor in the order of 3 in the case of slow growth, and a little more than 2 in the case of strong and controlled growth, thanks to the introduction of efficient techniques for the management of fertilizer use and also for the control of sediment removal (within the context of erosion control). In 1980, the countries contributing the most pollution to the Mediterranean Sea were Italy (more than 400 million tonnes per year), Turkey (nearly 300 million tonnes), Greece (more than 200 million tonnes), Spain (nearly 120 million tonnes) then Tunisia and Algeria (a little more than 50 million tonnes each), with depending on the case, 10-20 % of this sediment coming from agricultural land (up to 30 % in the case of Greece and 40 % in the case of Algeria). The kinds of

development that neglect the environment will witness a growth in these percentages (especially in the case of slow growth, with the gradual spread of farming to fragile marginal land, sensitive to erosion), whereas only the kinds of development concerned about protection of the environment and resources could bring about a decrease.

96. Industrial activities on the coast are a serious and growing threat, perhaps less for major installations whose emissions can be more easily controlled than for the small- and medium-sized plants which could proliferate on the coast. Only the vigorous regulation of installations, and both preventive processes (clean technologies) and the systematic use of less polluting processes, would make it possible to combat the exponential growth of wide-spread forms of pollution.

97. Pollution associated with maritime oil transport should barely increase -since overall traffic would not grow much- but a decrease in the short- and medium-term is not expected because of delays in renewing fleets and lack of installations on land (which will prevent compliance of the MARPOL 1973/1978 obligations concerning oil spills in the Mediterranean). It is assumed that environmental-minded kinds of development will speed up construction of this kind of installation. Aside from oil, the risk of accidental pollution from chemical products in particular will rise most in the case of strong economic growth (with increased trade), and less in the kinds of development with rigorous environmental protection regulations.

One important problem linked to growing electrification and the location of thermal power stations on the coast is that of thermal waste. If co-ordination is poor, these stations will create localized zones of high temperature which effect fauna and flora (whose sensitivity to temperature in the Mediterranean is well known). Development with co-operation assumes co-ordination at regional level regarding the number of plants to be envisaged.

98. Concern for the long-term future implies particular attention - although relatively independent of the scenarios- to the global problem of a warming of the planet on account of the "greenhouse effect", caused by exhaust (and industrial) fumes. It could cause the Mediterranean Sea

to rise from between 0.40 m to 1.20 m, with considerable -even disastrous- economic and ecological consequences for the whole of the Basin, for several cities (Venice and other coastal towns), for the deltas (the Nile in particular is already subject to a disturbing degree of erosion), for on all the coastal plains, beaches, etc. But these are only hypotheses based on as yet unconfirmed scientific work, but which Mediterranean populations should not neglect.

Finally, it should be recalled that most of the threats to the coast have repercussions on the sea : in addition to the effects already mentioned, the impact on choice reproduction zones for living resources must be stressed. This threat to the reproduction of species, aggravated by over-fishing in some growth patterns and by degradation of the marine environment from land-based pollution, justifies the most rigorous environmental protection policies associated with a development based on the conservation of the environment and resources.

*

99. This kind of lasting development implies, in particular :
- co-operation for better information about existing fish stocks (demersal and pelagic species), their migration patterns and reproduction cycles (especially for the eastern basin), with a view to optimizing fisheries;
 - within the framework of living resource conservation, intensified control of pollutants that destroy the marine biomass, particularly pesticides, detergents, heavy metals, chemical substances, hydrocarbons and radioactive waste.
 - maximum limitation of physical aggression on the marine environment through spills of non-biodegradable substances or the destruction of the sea bed ;
 - systematic, continuous monitoring of chemical pollutant discharges into the sea from all rivers.

IV. SUGGESTIONS FOR ACTION
AT THE NATIONAL AND THE MEDITERRANEAN LEVELS

100. The developments described above by sector of economic activity and by kind of environment comprise suggestions for action. In fact it was intended from the start that the Blue Plan serve as a tool in the decision-making process, rather than continue its action to analysis. Moreover, the futures explored depend largely on the policies, decisions and actions undertaken. It is therefore useful to identify those whose outcome would be decisive for environmental protection, and which could alter the images of the future as they have been depicted.

Action could be taken :

- either at national level (for the whole country or for the Mediterranean). The broader suggestions made here supplement those already proposed by sector or by kind of environment :
- or at the level of intra-Mediterranean co-operation, for which the Blue Plan suggests new areas of exchange, collaboration and solidarity.

I. NATIONAL ACTION

101. On the basis of the overall prospective study carried out by the Blue Plan at the level of the entire Mediterranean Basin, it is for each country, and each alone, to identify the major problems it may have to face. The Blue Plan work highlights the considerable heterogeneity of national situations.

It is then for the states to define national policies which will enable them to avoid or rectify the regrettable consequences of these problems for one or other component of the environment, including the establishment of institutions and the methods of public or private financing to be promoted in order to assure environmental management.

Finally, it is for the states to supplement, strengthen or reorganize the action programmes under way within the framework of the policies defined, and to implement the new programmes which seem necessary.

The strengthening or implementation of national action programmes would benefit, if necessary, from harmonization within the framework of regional or bilateral programmes, for which some suggestions are made further on. In addition, it is essential that the Mediterranean

countries take a more active part in the study of global problems which effect or will inevitably effect the environment of their region.

1. National development strategies

102. To ensure lasting development, compatible with the protection and improvement of the Mediterranean environment, the coastal states should give special importance to the following aspects of their national development strategies :

- a) systematic attention to protection or restoration of the land and marine environment within plans, programmes and development projects at the national, regional or local level ;
- b) consideration of the interactions between technologies and the various components of the environment (resorting to suitable technologies, followed by their methods of application) ;
- c) study of the possibilities of employing and mobilizing human resources in relation to the use of natural resources and the kinds of development chosen in the various sectors of economic activity ;
- d) study of trade possibilities, and particularly of business competitiveness, bearing in mind both the constraints and the positive economic repercussions of environmental protection ;
- e) adjustment of national action with respect to the international context, especially the Mediterranean context, bearing in mind, in particular, North-South and South-South relations within the Basin.

2. The scenarios

103. The scenario method was fruitful at the level of the Basin as a whole. It is useful at the national level, and many countries have started long-term work on this basis since 1986. This work would improve if it were continued in depth during the coming years.

Scenarios could also be established for well-defined areas, the coastline, for instance, or for decentralized units such as regional or local authorities, national or regional nature reserves, port authorities, public institutions, etc. One advantage of a prospective study is that it can be converted into sets of long- or medium-term objectives. The formulation of these sets, or goal "charters", would be

one way to mobilize those partners whose action is decisive for the environment. The simple components of prospective studies, at their level, based on national planning and an overall prospective study at the Mediterranean level, would make it possible for the "charters" (which should be well disseminated and concern well-defined time spans), to elicit the participation of the agents and the population concerned. Each year, the publication and dissemination of the results achieved, in addition to their contribution to better overall knowledge of trends, could foster emulation.

3. The coastline

104. In any event, even in the most favorable scenario, it will be very difficult to protect of the Mediterranean environment along the coastal strip, because of growing human pressure and the vulnerability of the natural environment, especially in the southern and eastern regions of the Basin.

The coastal regions (including their coastal waters) are the most endangered areas. The coastline, where most human activity tends to concentrate, demands absolute priority, as was given to the sea some twelve years ago.

The actions of national and decentralized authorities (cities, ports, tourists resorts, etc.) can counteract trends or, on the contrary, aggravate them.

The kinds of measures taken can vary : incentives, regulations, prohibitions (for example, on construction along the coastal strip as such*), establishment of stricter specifications for the areas close to the coast (for sanitation in particular), extensive planning and development to receive new industrial installations, warehouses, or tourist facilities in the hinterland.

* some countries have prohibited construction from 50 to 100 or more metres away from the waters' edge

The Blue Plan studies highlight the special interest of protecting the coastal zones (lagoons in particular) suitable for aquaculture which, in future, will contribute to achieving a better long-term food balance in the Mediterranean.

The absolute protection of zones identified as fundamental for the ecological balance, the conservation of landscapes, and protection of Mediterranean species are priorities. Strictly protected natural areas, of varying size depending on the country, could be determined by each coastal state. Special attention should be given to the protection of wetlands and the marine environment (marine reserves).

4. Understanding and behaviour

105. Without greater awareness on the part of the public about the interactions between, on the one hand, the environment and natural resources and, on the other, individual and collective activity, it will be futile to expect a rapid and smooth evolution towards satisfactory forms of lasting development in the Mediterranean Basin as a whole. This kind of change must be promoted in the first place at national level through education, training and public information. The Mediterranean countries should devote more systematic and consistent efforts to :

- a) the development of general education on the Mediterranean environment ;
- b) the training of national specialists (researchers, engineers, technicians, etc.) likely to implement the components of lasting development, incorporating the basic concepts of environmental protection and consideration of hazards ;
- c) the diffusion of objective and serious information to the public about the possibilities and constraints of the environment in which they live, directing it at various age groups and stressing the fact that one generation takes over from another.

II. FIELDS OF MEDITERRANEAN CO-OPERATION

106. The prospective study on the Mediterranean Basin could only be initiated with the agreement of all the coastal states concerned,

anxious not to be outstripped by the future not only as regards the environment, but also development, and perhaps the standing of the Mediterranean region in the world. Thus it is normal for the last part of this report to be devoted, in turn, to this co-operation between coastal countries, starting with issues likely to emerge, or become more pronounced, in the near future. In view of the scenario findings, the Blue Plan officials would therefore venture to make some suggestions on intra-mediterranean action to decision-makers, who could assess their suitability for implementation. This could take various forms :

- multilateral or bilateral co-operation
- establishment of exchange networks
- joint projects
- development of solidarity.

1. The progress of knowledge

107. Concerning data and statistics, it must to be recognized that in the Mediterranean the measuring mechanisms still provide a very inadequate basis for projections and choices. The statistics supplied by the international organizations, which divide up this part of the world somewhat artificially, are limited. Entire areas elude analysis, or are documented by unreliable data.

This is the case, for example, of data on :

- transborder relationships concerning air-sea pollution
- use of the coastline
- endangered species
- the quality of surface water and groundwater
- domestic tourism by region, etc.

Identification of these shortcomings and the establishment of some fifty series of comparable statistics and key indicators would be useful. The places where environmental data are gathered should be better identified and the efficiency of data collection improved. Well-connected networks based on data banks could also be established, accessible to all the coastal countries. In addition, experience has shown how difficult it was for a number of countries to obtain data concerning the Mediterranean regions as such, and the coastline itself.

The harmonization of statistics or data gathering according to administrative districts, or appropriate spatial divisions (e.g. by watersheds) could be the subject of collaboration and would be of great help for future work.

108. The emergence of new techniques can facilitate or modify the measuring, gathering, and processing of data and their presentation (automatic cartography). Remote sensing, for example, will contribute significantly to renewing continuous monitoring techniques for plant life, urbanization, soil, climate, the sea, and the coastal strip. Intra-mediterranean co-operation for monitoring by "ecozones" would make it possible to develop links, still very inadequate, between the production of basic images and the users, on the basis, for example, of joint interpretation of some important coastal sites.

109. At the level of research, the countries could identify areas of knowledge to be explored, or gaps existing between scientific knowledge, decision-making, and practical application. Thus environmental meteorology, the clinical study of plant diseases (tree diseases in particular), the recycling of water resources, the application to agriculture of genetic discoveries concerning conservation or selection, could be useful to all Mediterranean people and, for some countries could reduce the delays in transfer of technology. Without an active policy for the intra-Mediterranean dissemination of knowledge, the gaps are likely to widen between countries in, for example, the application of bio-technology agriculture.

110. As regards the environment, Blue Plan experts sorely lacked a study of attitudes, behaviour, demand, and needs. Some work carried out on behaviour (use of leisure time, food consumption, environmental awareness, etc.) showed that forecasting exercises were insufficiently illuminated by societal prospects, in the broad sense. Here, no doubt, the answer is to establish a network which would make it possible to exploit, throughout the Mediterranean, papers, monographs and theses undertaken, for example, within the academic framework.

2. Co-operation on management and the environment

111. Collaboration by sector or specific issue seems to be one of the most accessible and productive ways to strengthen environmental policies or incorporate them into development policies.

Some forms of co-operation could be based on existing structures : this is the case, for instance, of Mediterranean fisheries (General Fisheries Council), "Silva Mediterranea", or Cefigre for training in water management ; other structures remain to be established in areas where experience is still lacking.

Collaboration could also stem from the establishment, on a formal or informal basis, of exchange and co-operation networks. The Genoa Declaration (1985) foreshadowed this linkage for example by proposing the identification of 100 historic sites of Mediterranean interest, or 50 new protected sites on the coast whose officials could soon meet to exchange experience.

Within the framework of the Mediterranean Action Plan, the MEDPOL programme, which links a number of research and analysis laboratories, and the Priority Actions Programme, which gathers together specialists on specific subjects, operate in the same way.

Among the topics which seem useful in a long-term prospective view are : co-operation on spatial management, co-operation on industrial technology, and co-operation on breaking points and hazards.

2.1 Co-operation on spatial management

. Coastline management

112. For reasons that were clearly stressed by the Blue Plan, development of the Mediterranean coastline requires collaboration to adjust planning and development policies and practices likely to reduce the pressure of cumulating effects on the coastline, and to envisage the in-depth development of the hinterland.

Co-operation could start with planning and development methods, conservation regulations, standards or mechanisms, the use of remote sensing, promotion of awareness among tourists of the environment and landscape to be protected, and protection of the near-shore area.

. Urban management

113. Urbanization calls for collaboration, among professionals, on policies for establishing new towns, mechanisms for controlling the use of peri-urban areas with minimum encroachment on agricultural land, the channelling of spontaneous urbanization, the construction of housing and public areas, urban transport, and the protection and restoration of historical centres. Urban management is another area for collaboration (waste, sanitation, water, noise, traffic, plantings, etc.). Among the means employed, the possibility of "co-operation-twinning" is particularly interesting.

. Management of water resources

114. The uncertainty and irregularity of water resources constitutes a real bottleneck for Mediterranean development particularly for the southern and eastern countries.

Collaboration could focus on several aspects : institutions, training, distribution of drinking water, sanitation techniques, water-saving irrigation techniques, re-use of waste water for agriculture, solar pumps, desalination of sea water, supply of water to small islands.

. Forest management

115. Co-operation could be very beneficial in the following areas : both research and action programmes on diseases specific to Mediterranean trees, procedures for re-planting by stages, combating forest fires, clearing undergrowth and exploiting by-products, alternatives to fuelwood, development of watersheds, experiments with stable farm-forest cum grazing systems, methods of multiple-use forest management, etc.

• Management of protected areas

116. The genetic heritage of the Mediterranean region, as regards both wild species and cultivated or domestic varieties, is exceptionally rich, but is seriously threatened in the coastal countries despite the commendable efforts made by some of them during the last few years. This situation must be rectified for marine and coastal areas through effective implementation of the Barcelona Convention protocol on protected areas. It is essential, however, to extend action to all the Mediterranean climate land ecosystems in the region and, for this purpose, to set up and assure the harmonious and co-ordinated management of a systematic network of protected areas, particularly biosphere and biotope preserves. This network should also contribute to improving research on the rational management of ecosystems and promoting environmental training and education. At the same time, the conservation of outstanding sites and Mediterranean landscapes should bolster this effort to conserve ecosystems, and could be an area of co-operation.

In any event, it is essential that the management of protected areas and the conservation of landscapes be based on the co-operation and participation of local people, and that it bring them, as far as possible, the advantages they have the right to expect.

2.2 Co-operation on industrial technology

117. The number of new industrial plants in the south and east of the Basin in particular will create an urgent need for precautions to be taken on installation, recycling, and on depollution devices. It will be just as useful, however, to exchange the tools and procedures of "clean technologies" introduced into industrial processes, which make it possible -often with economic benefit- to reduce waste, save material and energy, and re-use by-products.

This is a broad area for exchange between professionals from the north and south.

2.3 Co-operation on disruptions and hazards

. Erosion of the genetic heritage

118. Only a small number of the domestic animal and plant varieties that were known in the Mediterranean a century ago still remain : bovine, ovine and caprine varieties have all been affected by selection (only 10 % remain), bush species and plant varieties which were part of the traditional diet have disappeared. The rapid establishment, in addition to the protected area networks, of biological reserves, gene banks, botanical gardens, and biosphere reserves covering the land ecosystems of the Mediterranean region, will contribute to conserving ex situ and in situ the components of the wild or domestic genetic heritage of the region, in order to maintain the domestic varieties and wild fellow- creatures essential for the continuous selection of varieties in the future.

. Geological and climatic hazards

119. Natural hazards have always existed in the Mediterranean, whether earthquakes, volcanic eruptions, floods, or landslides. The droughts and irregularities of the climatic cycles are a bigger, and often less publicized hazard ; solidarity is all the more effective in these spheres as it concerns neighbouring countries likely to be affected, in turn, by the same calamity.

. Technological hazards

120. Technological hazards are becoming increasingly serious in the Mediterranean Basin with the development of the industrialization , manufacture, marketing, and land and sea transport of new chemical products, the increase in toxic waste, the production of nuclear energy, etc. Co-operation can focus on assistance, but also on prevention techniques and practices, identification and marketing of new products (pesticides in particular), adoption of suitable legislation, measures to be taken in case of accidents, or transborder co-operation among local authorities. All coastal states could take advantage of the

progress made by some industrialized countries, and of European collaboration, already underway.

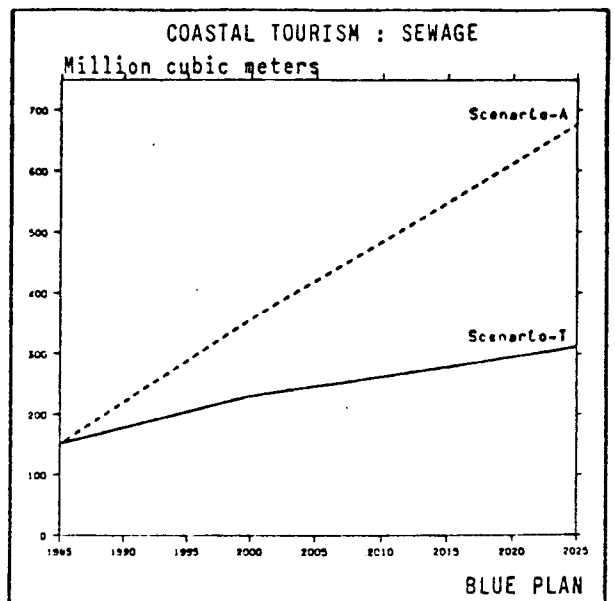
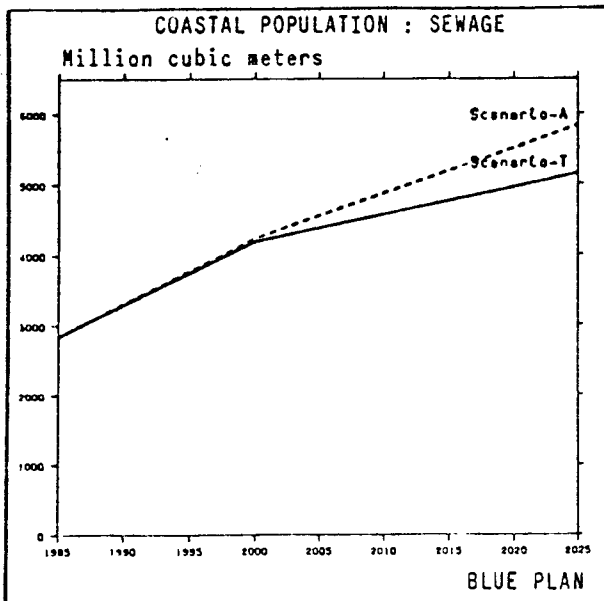
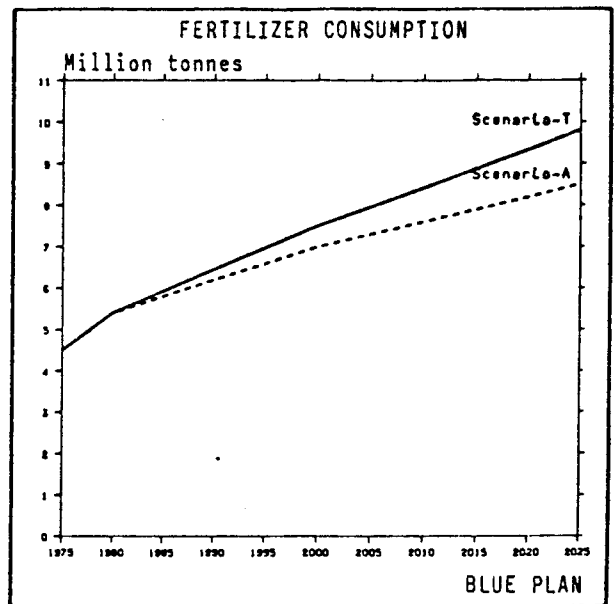
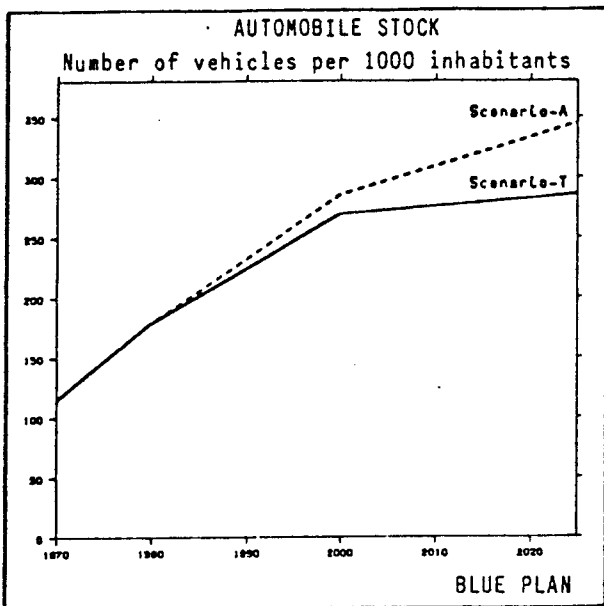
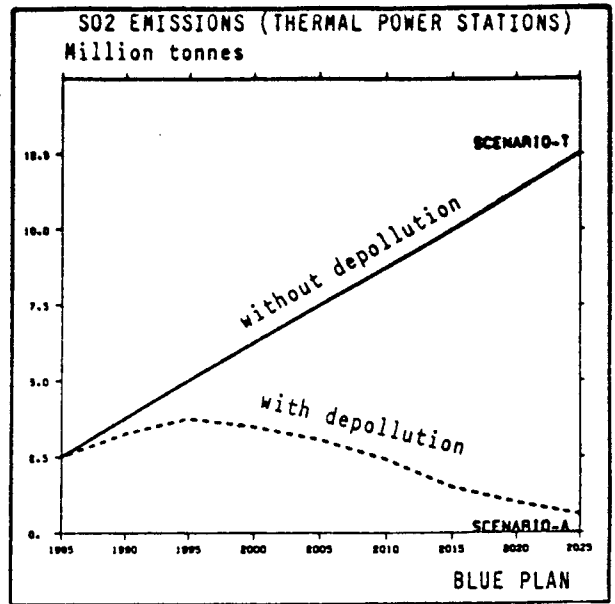
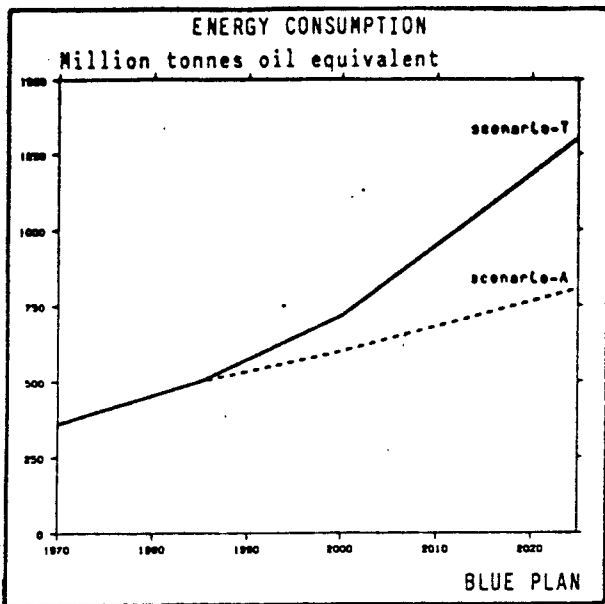
3. From collaboration to Mediterranean solidarity

121. Co-operation on Mediterranean areas and environments or on environmental techniques are essential, but the work of the Blue Plan highlighted the interest of collaboration further upstream in a number of major sectors of economic activity, leading gradually to the tangible expression of true Mediterranean solidarity.

The way to co-operation and collaboration lies, in the first place, through bilateral relations, a review of which shows that they could be extended. The environment should be given more importance in bilateral scientific, technical or commercial agreements between Mediterranean countries.

Very considerable improvement of relations among neighbouring countries is required to achieve better international balance, including in areas such as maritime, and also air and road transport, electrical inter-connections, data exchange, and communications. A mesh of bilateral and multilateral exchanges should link up the Mediterranean Basin, where currently preference is given to relations along certain main lines, whose lesser ramifications tend to be neglected. The situation can be improved by strengthening short-distance relations, still too limited, particularly among southern countries.

122. At the regional or international level, increasingly numerous forms of collaboration are pursued within organizations where the Mediterranean States are involved in decision-making processes which do not pay sufficient attention to the Mediterranean identity, especially the distinctive features of the Mediterranean environment. Very different kinds of organization, such as the European Economic Community, the League of Arab States, FAO, WHO or regional economic organizations, are collaboration or decision-making levels in which the Mediterranean countries participate on one count or another. It would be appropriate for these bodies to take the special nature of the Mediterranean into account as early on as possible. The concerns of the



Mediterranean countries would benefit from being better known before the adoption of environmental policies by these organizations.

More specifically, the work of the Blue Plan highlights the fact that a more advanced form of collaboration could be fruitfully initiated in three major areas of economic activity : food and agriculture (resources and consumption), energy and tourism.

123. One of the first sectors to be reviewed should be that of food and food resources. The fact that in forty years self-sufficiency levels in the Mediterranean regions will have fallen from 60 % to 40 or even 30 % requires collaboration in order to organize a stronger kind of solidarity, which would avoid a rupture, with its many repercussions, including on the environment.

The inevitable drop in self sufficiency in the Mediterranean region has raised the issue of food security in the south and east of the Basin, one of the most important areas of co-operation.

First of all, financial or commercial co-operation would facilitate orderly specialization in production, and would justify agricultural intensification which, properly managed, would exert less pressure on the environment. The ensuing transfers of technology require intense co-operation in agronomic research to be successful. The shortage of resources that could be allocated to research between the north of the Basin and the south and east is an argument in favour of the identification and joint management of basic resource conservation programmes (soil fertility, water use, creation and conservation of varieties or species, etc.) priority research and development programmes on products subject to shortage (cereals, oleaginous plants, etc.) or to strong demand (fruit and vegetables). The same kind of approach is valid for stockfarming, fisheries and aquaculture.

124. Energy is another sector where effective collaboration could start up rather quickly. The differences between consumer and producer countries will tend to dwindle with time, and all countries have experienced or will experience the vigorous development of electrical energy. Electrical energy is therefore a special area for the exchange of experience and know-how, particularly on supply, clean combustion techniques, etc. The use of natural gas, already important and a link

between various Mediterranean countries, could considerably increase. Co-operation could focus on exploration, production and utilization techniques.

Knowledge acquired on solar energy and other renewable sources of energy, could, in the end, create a true technological bridge between north and south.

125. Finally, tourism, rapidly developing in a somewhat haphazard way, in which all Mediterranean countries naturally compete, could be the subject of active collaboration. It could first focus on the instruments for acquiring information about demand and occupancy rates, which are often known only superficially and with margins of error that sometimes exceed 30 % : it could also focus access systems (air in particular), intra-Mediterranean tourism, "time-planning", tourists from outside the Mediterranean, the in-depth planning and development of the coastline, or health risks.

4. The young generation

126. Education, information and consciousness-raising among the young public is one of the main keys to the future. In this respect, any way to improve awareness could be the subject of fruitful exchange between coastal countries : manuals for young people, teaching experiences in the field, television programmes, all offer possibilities for exchange and complementarity.

The way to raise awareness among young generations and officials will mainly be to give visibility to efforts undertaken to improve the situation and to integrate suitably development and the environment. State policy and its implementation, together with policies of local authorities, are too little known and publicized. It would therefore be useful to diffuse information among Mediterranean people about efforts undertaken in the other countries. Emulation and stimulation among countries, cities and associations and clubs are necessary to bolster the efforts of those who, in the sphere of the environment, occasionally feel isolated.

127. Raising awareness of the fragility of the environment is one aspect : entry into working life is another. The problem arises everywhere of training for environmental professions, but even more for professions which must increasingly take into account basic concepts of the environment. The training of specialists, engineers and technicians is one of the most fruitful means of North-South co-operation, one of the easiest to implement, and the one whose results will prove to be the most useful. This kind co-operation for training, already under way among Mediterranean countries in some areas, could be developed for all areas of environmental protection, resource management, environment-development prospective studies, or any other field identified above.

The difficult state of the employment market in general also raises the growing problem of the incorporation of the young people into working life. Communal work schemes mobilizing youth are being tied out in various places. Environmental protection can and must be given an important part in these initiatives.

128. It is not easy to grasp the extent of the changes which will take place in the Mediterranean Basin during the next forty years. Perhaps it can be better understood if one considers that 60 % of the people who will be living in the Mediterranean in 2025 are not yet born. These some 325 million Mediterranean people of the future will not perhaps not have the same cultural and material references as the present generations. Their basic needs, however, will not be very different from ours. It is the present generations whom they will hold accountable for the environment they find. It is for the Mediterranean people of today to take immediate action to counter adverse trends and to prepare an acceptable future for themselves and their descendents.

APPENDIX

BLUE PLAN APPROACH AND IMPLEMENTATION

I. BACKGROUND

Shortly after the Stockholm United Nations Conference on the Human Environment, the Mediterranean coastal countries decided to formulate jointly and to implement a Mediterranean Action Plan, under the auspices of the United Nations Environment Programme. In addition to legislative and scientific activities directly concerned with protection of the Mediterranean Sea, the Action Plan was to include a **socio-economic component** intended to trace the origins of environmental degradation and to undertake the integrated planning of development and more careful management of the resources of the Mediterranean Basin. For this purpose, it was decided to conduct a future-oriented study at the level of the Basin as a whole. The "**Blue Plan**" was thus instituted at the Split intergovernmental meeting in February 1977, and is the first prospective study on relationships between development and the environment launched by all countries within the same region.

The "Blue Plan" is clearly not intended as an instrument for guiding or centralizing planning. It is first and foremost a **study aimed at the long term (2000- 2025)**, undertaken jointly by participating states, and available to the authorities and planners in the various countries of the Mediterranean region. The information it contains will assist them in formulating their own plans to ensure lasting, optimal socio-economic development, while avoiding excessive degradation of the environment. It forms a store of knowledge immediately accessible to all countries involved. It initiates a continuous process of co-operation among Mediterranean authorities at the various levels.

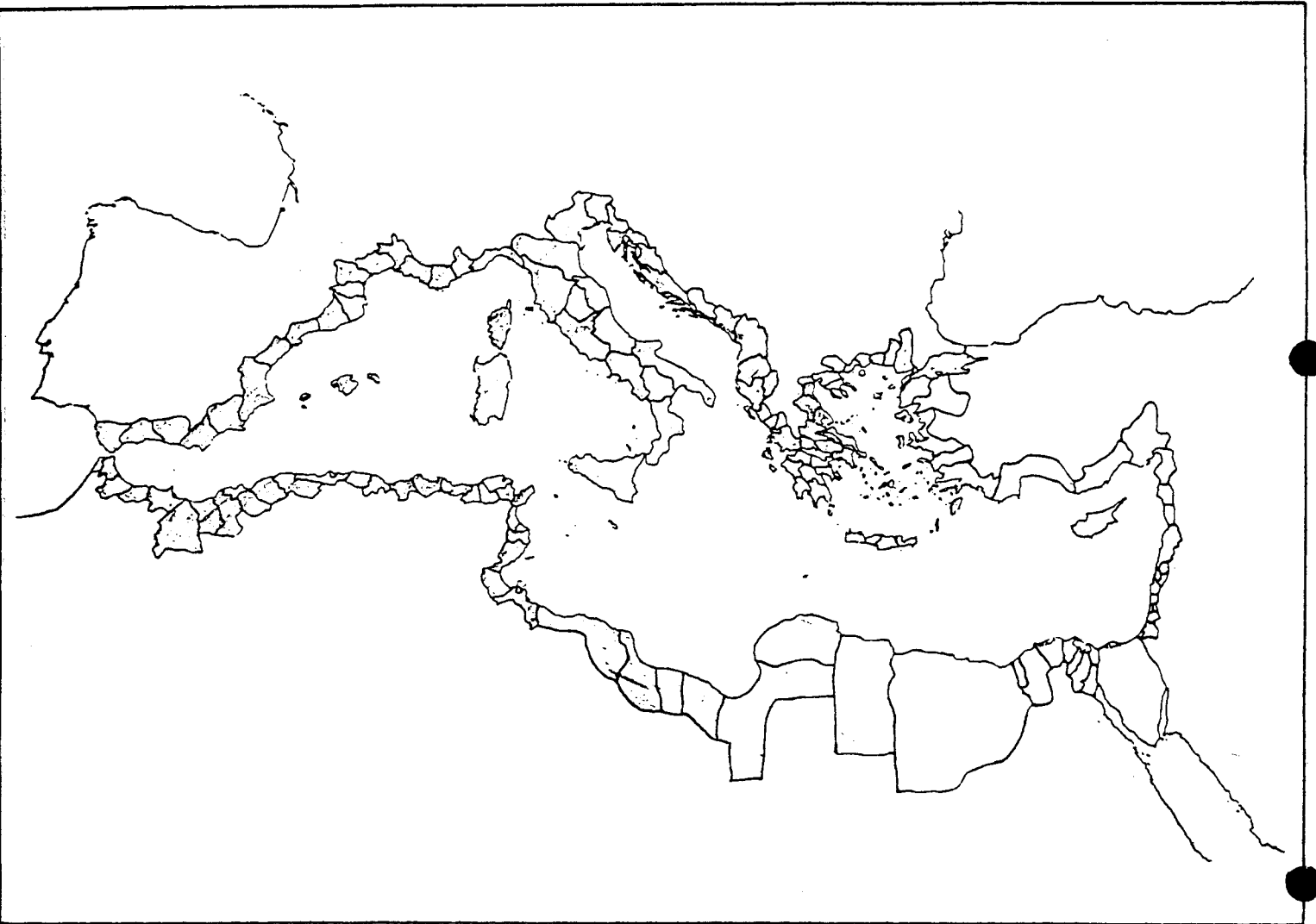
In 1977 -ten years ago- project implementation was designed in **three phases** : an initial reconnaissance phase, an in-depth study phase, and a phase of presentation and discussion of the findings. All work was carried out in close collaboration with the states concerned through the Blue Plan "Focal Points" nominated by each country, and was broadened on the basis of national inputs.

The exploratory first phase (September 1980 - May 1984), under the responsibility of a seven-member "Group of Co-ordination and Synthesis" was based on twelve sectoral studies (agriculture, water, energy, population, culture, etc.), entrusted to twelve pairs of experts (one from the north and one from the south of the Mediterranean). It gave rise to a series of synopses, transmitted to the Member States, which were summarized at their request in a booklet, distributed in more than 5 000 copies, in French, English and Arabic.

The methods and work programme of the second phase, based on functional or systemic analysis, using exploration tools such as "scenarios", were discussed and approved in Athens in May 1985 ; work began immediately thereafter. The second phase as such ended in mid-1987 with the presentation of a preliminary report.

The third phase will end with the diffusion of the final reports.

BLUE PLAN MEDITERRANEAN REGIONS



There are no clear criteria for defining the Mediterranean regions. For some of its work, the Blue Plan decided to use data and statistics concerning the administrative units along the coast. These units, which differ from one country to another, are outlined on the above figure.

II. APPROACH AND METHOD OF WORK

The relationships between development and the environment in the Mediterranean basin lead to focusing attention on five main environmental "components" :

- the sea, soil, inland water, the forest, the coastline, (40,000 km under increasing conflicting pressure from most human activities).

As regards development, it interacts mainly with the environment, not only through the effect of population growth and its spatial distribution (urbanization and coastal concentration), but also through the impact of the five sectors of economic activity considered essential because of their impact on the environment :

. **agriculture**, required, in the countries to the south and east of the basin, to meet the food needs of a rapidly growing population. An intensification of the factors of production can be expected, which will then exert considerable pressure on land and on water resources.

. **industry**, whose plants (some of which fairly polluting) are likely to be increasingly concentrated on the Mediterranean coast.

. **energy**, a resource unevenly distributed among the Mediterranean countries and the source of considerable trade, most of which maritime ; it will long continue to exert considerable pressure on the environment and the coast, where many installations are also located ;

. **international and domestic tourism**, of special significance in the Mediterranean (the world's leading "tourist basin"). Tourism, also heavily concentrated on the coast, entails a special form of urbanization and involves capital investment used only several months a year ;

. **land, sea and air transport**, which stems from the other sectors of activity, but plays a role in structuring development and has serious consequences on the use of space and the quality of the environment.

It was decided to consider two time horizons for the Blue Plan prospective exercise, 2000 and 2025, and to prepare a limited number of scenarios for the global exploration of possible futures :

- a **reference trend scenario (T-1)**, based mainly on the continuation of current main trends ;

- a **worse trend scenario (T-2)**, in which development problems are aggravated within an international context of persistent economic recession and harsh competition, and the environment is too often undervalued when difficult economic choices have to be made,

- a **moderate trend scenario (T-3)**, with recovery of more vigorous development within the framework of increased international co-operation and genuine -although inadequate- efforts to pay more attention to the environment.

These three scenarios continue current trends, aggravate or attenuate

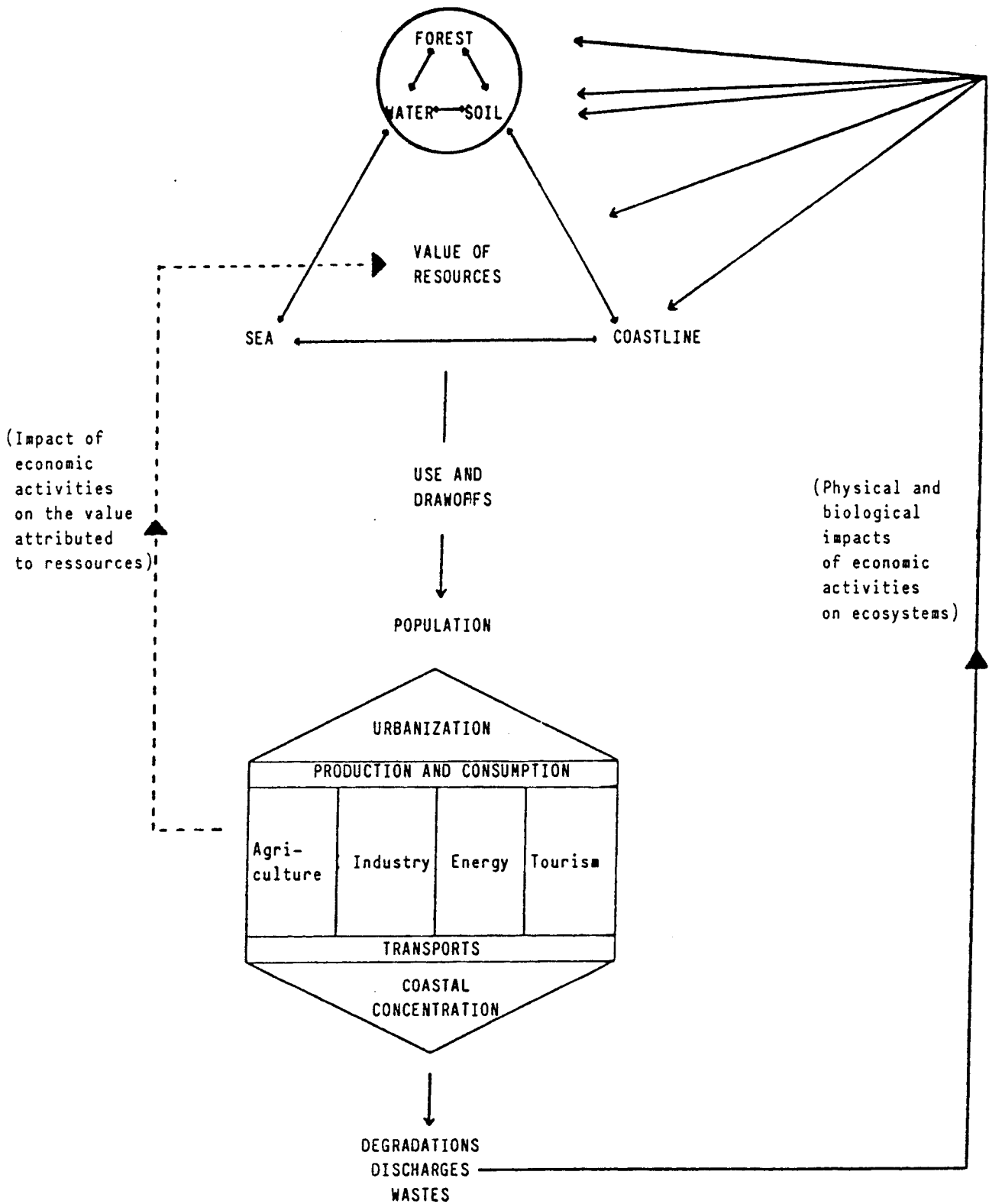


Diagram of relationships between environmental components and development activities

them depending on the case, but do not question them.

Two other scenarios, termed "alternative", which are goal-oriented and affirm a certain Mediterranean identity, pay more attention to the environment :

-an alternative reference scenario (A-1), based on a more self-reliant form of development (better use of national or regional resources ; search for complementarity between the traditional and modern sectors ; more appropriate technologies), broader North-South co-operation, and incorporation of the environment into decision-making and planning processes.

- an alternative integration scenario (A-2), in which (while the northern countries consolidate within the European Community) a number of countries to the south and east of the Mediterranean basin decide, in turn, to form regional bodies, geared to the creation larger markets, and optimizing, at the regional level, use of the enlarged area. The environment, incorporated into decision-making and planning processes to a greater extent, would be taken into consideration within the framework of increased South-South co-operation.

III. ORGANIZATION OF WORK

The preparation and implementation of the second phase of the Blue Plan was reviewed by meetings of the Contracting Parties in Athens (April 1984) and Genoa (September 1985), and also by meetings of the Focal Points (January 1984, May 1985, July 1987).

To ensure the "open book" participation of the Mediterranean countries in the second phase of the Blue Plan, the Athens Intergovernmental Meeting (April 1984) decided to establish a Steering Committee, which held eight sessions and was closely associated with the basic aspect of the work.

Research work was carried out by a very reduced central team (which did not exceed a staff of three researchers, compared to the six to eight initially envisaged) under the guidance of a scientific director, which received assistance from Mediterranean consultants.

In order to base the envisaged scenarios as much as possible on the reality of the various countries concerned, the coastal states wished to formulate their own "national development/environment scenarios", according to following a common framework defined beforehand by the Blue Plan team.

Since defining the scenarios* was a particularly delicate exercise, the Blue Plan team resorted to the assistance of an open group of some twenty scientific experts from the various Mediterranean countries concerned. Within this group, basic choices were always made through consensus.

While the specially created national teams formulated the Mediterranean scenarios, the central team, for its part, prepared global studies on population, urbanization, macro-economic development, agriculture, industry, energy, tourism, transport, environment/-development relationships, specific impact on the coast, etc. Economic

* The scenarios were formulated without resorting to the construction of a large-scale model.

and environmental data were gathered at the same time.

Finally, the central team maintained close contact with the other components of the Mediterranean Action Plan, i.e. with the Co-ordination Unit and MEDPOL Programme in Athens, the Regional Activity Centre for the Priority Actions Programme in Split, the Regional Oil Combating Centre in Malta, and the Regional Activity Centre for Specially Protected Areas in Tunis.

Numerous specialists -over five hundred in all- from all the Mediterranean countries participated in one or other phase of the work. During their formulation, the Mediterranean scenarios were submitted to a number of national teams or officials. As far as possible, consideration was given in their preparation to the "national scenarios" formulated or outlined by the countries. The Blue Plan Mediterranean scenarios aroused growing interest and benefited from numerous suggestions, confirming the truly collective aspect of the exercise.

IV DOCUMENTS

The documents stemming from the Blue Plan will comprise :

- the preliminary report, and its summary,
- specialized brochures
- data bases.

The preliminary report on the Mediterranean scenarios comprises an introduction, followed by five parts :

- the Introduction recalls the Blue Plan objectives and the background of its launching and progress ;
- the First Part, after a brief recall of the special nature and fragility of the Mediterranean environment, explains the choice of the main "components" of this environment and the most important economic activities ; an attempt was made to relate components and activities within the prospective study ;
- the Second Part explains the reasons for choosing the scenario method and its advantages, and presents the hypotheses and "dimensions" selected for the Blue Plan scenarios. The main lines of the five scenarios selected are then described, followed by the population and macro-economic scenarios, at the overall Mediterranean level ;
- the Third Part presents the sectoral prospects for agriculture, industry, energy, tourism and transports ;
- the Fourth Part analyses the consequences of these various activities on the Mediterranean environment according to the scenarios and makes a summary of the pressures exerted jointly by them on each of the environmental "components" : the sea, soil, forest, and the coast ;
- finally, the Fifth Part summarizes the main findings and major lines of future change.

This preliminary report, submitted to the Governments concerned on the occasion of the Meeting of Contracting Parties in Athens, September 1987, is an initial version which will be revised and produced in its final form by the end of 1987 in the light of observation made by Governments and taking into account any comments or additional information which may be forthcoming.

In addition, a number of specialized brochures are being prepared, corresponding to a more thorough study of the scenarios by subject matter and specific prospects for various economic sectors (analysed more deeply than was possible in the report), and also of the main geographical features. Each of these brochures submitted to review and comment by a number of specialists from various countries, will contain between 40 and 100 pages, depending on the subject. A list of the brochures envisaged is given below :

1. Development of the coast and coastal regions
2. Evolution of urban systems
3. Evolution of intensive agriculture
4. Evolution of the hinterland and mountain regions
5. Conservation of fragile areas, fauna and flora
6. Evolution of the Mediterranean forest
7. Prospective study on water resources and needs
8. The future of the islands
9. Pollution of the sea
10. Living marine resources
11. Industry and the environment
12. Energy and the environment
13. Tourism and the environment
14. Transport and the environment
15. Major natural and technological hazards
16. Health, environment and development
17. Evolution of perception and behaviour in the Mediterranean
18. Regional and local institutions concerned with the environment and resources.

In addition to this report and the brochures, very extensive documentation was gathered and produced, essentially in the form of two data bases (environmental and economic statistics quantified both financially and in physical units) comprising several hundred thousand computerized items.

*

In this way a substantial volume of information was gathered about the Mediterranean regions, and a true network of scientific and technical co-operation developed during the Blue Plan work.