Mediterranean Action Plan: An Interim Evaluation

An innovative regional approach to pollution control is based on U.N. and government initiatives.

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Summary. The Mediterranean Action Plan is an extensive program of regional environmental cooperation on technical and institutional approaches to pollution monitoring, environmental assessment, and policy-making. The simultaneous development of a regional monitoring network and legal instruments to protect the Mediterranean from pollution is an important achievement, which provides a firm basis for continuing cooperative efforts.

The Mediterranean Action Plan (*1*) is a program of regional environmental cooperation that involves 17 of 18 littoral states (*2*), the European Economic Community (Common Market), and nearly a dozen international organizations and research bodies. Its activities consist of pollution monitoring and research, treaty drafting, and environmental planning and information exchange. Up to now, the U.N. Environment Programme (UNEP) has coordinated the Plan with the cooperation of other U.N. agencies, and it has been financed by the U.N. Environment Fund. However, the administrative and funding arrangements as well as the future scope and direction of scientific work have been under consideration by the participating governments and agencies since the spring of 1977. Now, midway through a pilot period of monitoring and research, the results of the actions initiated under the plan provide a basis for evaluating its accomplishments.

The aspects of pollution assessment and management being addressed under the Plan range from regional contingency and response planning for major oil spills to standard setting, data management, and enforcement. Trade-offs between economic growth requirements and environmental protection are a major consideration. Other areas of concern include the environmental consequences of offshore resource development, the identification and monitoring of pollution from land sources as it affects the marine environment, and the development of marine parks and recreational areas.

In this article I review institutional and scientific features of the Plan as they reflect Mediterranean conditions. However, similar programs are under way for other enclosed, semienclosed, or regional seas. As the inaugural effort in UNEP's Regional Seas Programme (*3*), the Plan is a point of reference for governments and international agencies involved in developing comparable programs in the Caribbean, Persian (Arabian) Gulf, West African coastal waters, Red Sea, east and southeast Asian waters, and southeast and southwest Pacific (*4*). Considering the current interest in the environmental effects of activities such as seabed mining, ocean dumping, and ocean and coastal oil and gas drilling and in the antipollution enforcement prerogatives of port states, the Plan is a useful case study. Efforts by Mediterranean states to find technically feasible grounds for environmental cooperation are also instructive in connection with multinational attempts elsewhere to manage terrestrial ecosystems and resources.

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Mediterranean Pollution

There is little agreement among Mediterranean coastal states on the effects of introducing increasing amounts of anthropogenic organic or inorganic substances into coastal waters. These substances are found mainly in industrial and domestic sewage effluents and in oil and petroleum hydrocarbons from shipping operations and manufacturing (Fig. 1). Part of the problem is the definition of pollution. Natural or synthetic materials introduced into the environment become "pollutants" only when their "distribution, concentration, and chemical or physical behavior are such as to have undesirable or deleterious consequences" (*5*). Knowledge of the transfer, transport, and accumulation processes that lead to harmful effects of pollutants on the marine environment (and ultimately, on humans) is at an early stage of development. Thus there is still considerable debate among Mediterranean scientists about the short- or long-term threat to the environment of heavy metals, toxic substances, nutrients, bacterial and viral organisms, oil, and radioactive materials.

The semienclosed nature of the Mediterranean Sea, its high evaporative loss, and the hydrographic and climatic diversity of the area make it difficult to determine pollutant pathways and effects. Because of the irregular coastline and the isolation of subregional basins and seas, pollutant dispersal rates vary considerably. Circulation patterns in the open ocean are only superficially understood, and even less is known about circulation in the heavily polluted coastal regions (*6*). Still, northern and southern coastal waters support shell fisheries, and there is no conclusive evidence that pollution has reduced open-sea fish stocks (*7*).

Another part of the problem is the attitudes of nations and people. In recent years, the intensified use of coastal areas for industry, urban settlement, and recreation and the growing trans-Mediterranean shipping traffic (*8*) have engendered occasional dramatic pollution incidents. However, the official response to such incidents can be desultory. This was the case in 1974 when the motor vessel *Cavtat* sank off the Otranto coast of Italy with 900 barrels of gasoline additives. The immediate threats to lucrative fishing and tourist areas were ignored for 2 years while Italy and Yugoslavia disputed jurisdictional authority and responsibility for recovery of the sunken chemicals (*9*). In general, popular concern about pollution in the Mediterra-

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nean varies from country to country, depending on the level of technological awareness and the extent to which government information media focus attention on national and regional environmental programs.

Beyond this, the Mediterranean Basin is a developing area subject to political and economic stresses. It illustrates many of the problems underlying the global dialogue between industrialized and poorer countries on fiscal and trade arrangements, responsibilities for development, and technology transfer. The differences between the northern-tier European and Balkan states and the Levantine and North African countries on many issues reflect economic and social inequalities.

The costs of pollution control are seen by some poorer countries as the responsibility of industrialized countries such as Spain, France, and Italy. Other developing states recognize the advantages of preventive measures, but feel that their special problems should be taken into consideration. Examples are Libya's concern for freshwater conservation in connection with her gas utilization project, Tunisia's emphasis on the management of coastal industrial zones with tourist potential, and Malta's interest in applications of solar energy.

Through its diverse activities, the Plan helps both northern- and southern-tier nations by fostering regional cooperation in the search for solutions to common problems. These include the deterioration of agricultural production systems, water supply and quality, imbalance between energy availability and cost, rapid urbanization, seasonal tourism, and shrinking mineral and material resource bases.

Evolution of the Mediterranean Action Plan

The Plan stems directly from the 1972 U.N. Conference on the Human Environment, which gave rise to UNEP and defined its "catalytic role as the focal point within the U.N. system for world environmental concerns" (*10*). The Plan is an imaginative and far-reaching attempt to develop substantive programs at the regional level in support of UNEP's wider mission. A decision of the UNEP Governing Council at its fourth session (March and April 1976) stated that "The successful achievements by [UNEP] in . . . protection of the environment in the Mediterranean region afford a concrete example of both the integrated approach and the proper co-ordinating role that should be the major concern of the Programme in its activities" (*11*).

Several key assumptions have governed the Plan's evolution since 1973. Foremost among these has been recognition of the desirability of involving government-designated institutions (university or government laboratories or research institutes) in project planning and design. A decision was made at an early stage to stimulate intergovernmental cooperation through frequent consultations among Mediterranean government and academic scientists before intergovernmental meetings involving diplomats and international civil servants. Independent funding of the Plan has ensured flexibility in response to shifting requirements of participants for travel support, training programs, and equipment. It has also facilitated coordination of the Plan's legal, scientific, and management elements (*10*).

The Plan was formally constituted and approved by 16 countries bordering on the Mediterranean in February 1975 at the Intergovernmental Meeting on the Protection of the Mediterranean (referred to below as Barcelona I). It was given further impetus 1 year later at the Conference of Plenipotentiaries of the Coastal States of the Mediterranean Region for the Protection of the Mediterranean Sea (Barcelona II). At this meeting the governments adopted the Convention for the Protection of the Mediterranean Sea against Pollution, the Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft, and the Protocol Concerning Co-operation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency (*12*). Adoption of the convention and two protocols in 1976 was a significant political event that spurred scientific and legal activities that

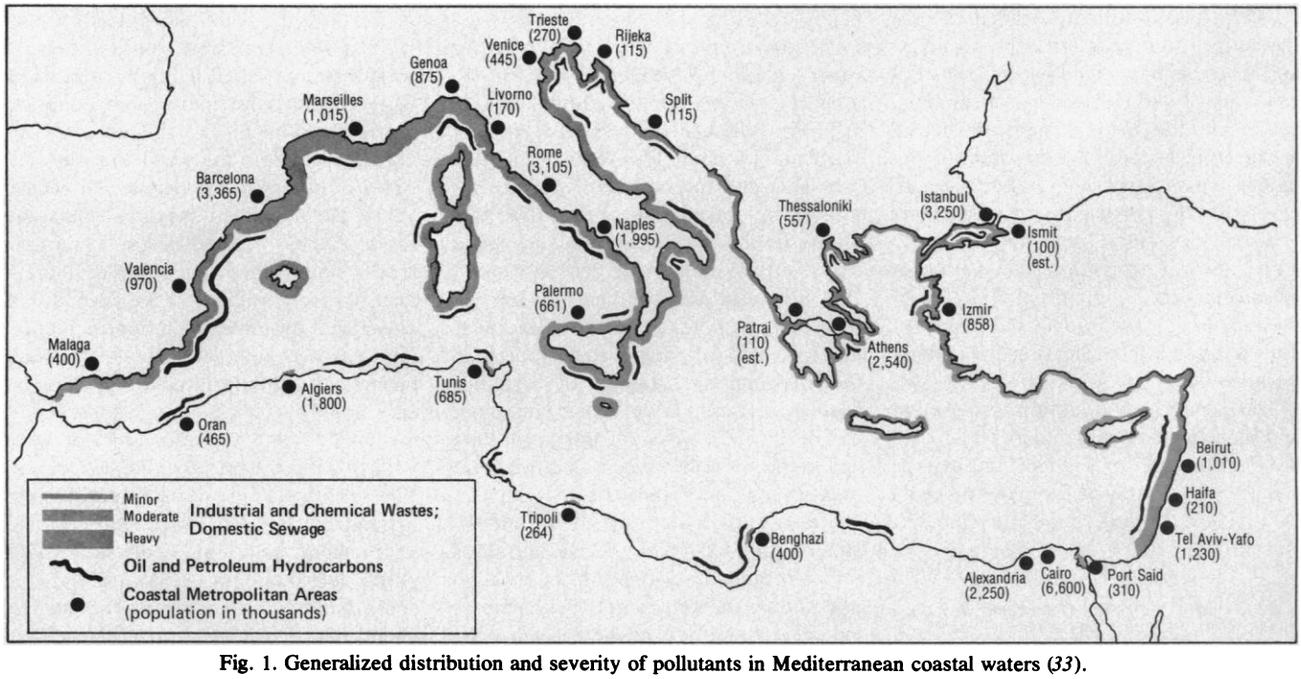

Fig. 1. Generalized distribution and severity of pollutants in Mediterranean coastal waters (*33*).

were already under way and indicated the powerful attraction of environment as a focus for international discourse. This was substantiated by the announcement at the January 1978 intergovernmental review meeting in Monaco that six required ratifications had been obtained and that the convention would go into effect on 12 February 1978 (*13, 14*).

Enforcement of the ratified convention and protocols will be the task of governments. Biennial meetings of contradicting parties will provide opportunities for information exchange on technical matters. Beyond this, contracting parties will be legally bound to comply with and enforce the protocols through national authorities to be established for that purpose (*15*).

Activities

The activities in support of the Plan, which have passed the halfway mark in its anticipated 2- to 3-year pilot phase are outlined below.

1) *Legal consultations* directed toward the preparation of a draft protocol for the protection of the Mediterranean Sea against pollution from land-based sources. This protocol deals with controversial criteria for categorizing and interpreting information on the nature, magnitude, and location of pollutants being discharged into the Mediterranean from major land sources and through rivers (*16, 17*). Coastal states have been unwilling to accept common standards, regulations, and enforcement practices. Developing states resent having to assume responsibility for control and cleanup equal to that of the major polluters (see Fig. 1), and the more industrialized states do not wish to publicize the inadequacy of their sewage and wastewater treatment for fear of damaging tourism. Another legal consultation in support of the protocol is scheduled for early 1979, and the protocol is to be presented for adoption at a subsequent intergovernmental meeting.

2) *Continued assessment* (at least through 1979) of environmental conditions through studies and monitoring of pollution from coastal and land-based sources. The Coordinated Mediterranean Pollution Monitoring and Research Program (MED POL) is a key element of the Plan as approved at Barcelona I. Seven original joint projects of UNEP and eight other specialized U.N. agencies support baseline studies of oil and petroleum hydrocarbons in marine waters (MED I); metals, DDT, polychlorinated biphenyls, and other chlorinated hydrocarbons in marine organisms; the effects of pollutants on marine organisms, populations, communities, and ecosystems; and pollutant transport and water quality in coastal waters (*18*). Other projects focus on biogeochemical cycling of pollutants in open waters and the role of sedimentation in Mediterranean pollution. Attempts are being made to show how physical and chemical factors affecting residual pollutant transport in coastal waters are influenced by the synergistic effects of pollutants in municipal and industrial wastes, and by agricultural fertilizers and pesticides in rivers emptying into the Mediterranean (*19*, p. 27). In support of the legal work outlined above, a preliminary survey of pollution inputs and waste management practices around the Mediterranean was prepared for governments (MED X) (*16*). Other UNEP-funded joint projects are concerned with marine ecosystem modeling, intercalibration of analytical techniques and common maintenance services, and establishing and maintaining protected zones (*19*).

3) *Administrative and financial support* from UNEP to encourage bilateral and multilateral cooperation on environmental matters among Mediterranean governments and international agencies. The areas of interest include soil protection, aquaculture, nonconventional energy, freshwater management, tourism, and human settlements. For instance, UNEP-sponsored meetings between scientists in Greece and France in the spring of 1978 to promote cooperation in aquaculture and the management of freshwater resources.

These activities are part of the "Blue Plan," or integrated planning component of the Mediterranean Action Plan. The specific objective of this component is to supply to decision-makers in Mediterranean countries information that can help ensure optimum socioeconomic development without environmental degradation. Undertaken in 1975 at France's initiative, the Blue Plan is primarily a research venture in which similar methodologies will be adopted by national planning agencies to analyze regional trends in urbanization, transportation, resource and energy development, agriculture, and industry (*20*).

4) *Coordination* of training, equipment supply, and intercalibration of instruments and standards for nearly 100 laboratories in 15 countries that participate or intend to participate in MED POL. A small UNEP coordinating unit in Geneva has negotiated more than 200 contracts with laboratories and other international organizations (*19*).

As these activities have progressed through specific projects, the Plan has taken on distinctive features. Political support by developing and developed coastal states, despite their ties to extra-regional economic and political groups, has ensured broad participation. Signatories to the Barcelona Convention include members of the European Economic Community, the Organization for Economic Co-operation and Development, the Arab League, the North Atlantic Treaty Organization, and the U.N. Economic Commission for Europe.

The Plan is unique in the extent to which governments, international agencies, and scientists have become involved; in the diversity of its scientific work; and in the contractual arrangements with laboratories in support of this work. It is realistic in scope and is tied to the region's future through the governments' endorsement of the role of UNEP.

Evaluation

The criteria for judging the scientific quality of individual projects under the Plan differ from the more subjective considerations needed to evaluate the overall contribution of MED POL in support of medium- and long-term pollution abatement goals. For example, in studies of the prevalence and effects of pollutants in marine organisms, communities, and ecosystems (MED II to MED V), the quality of project findings reflect the participants' success in applying common methodologies for reseach and data evaluation. Problems in project implementation include limitations on the extent of geographic coverage, inadequate consideration of transport and accumulation processes in determining pollution levels, and difficulties in interpreting analytical findings. Cooperation among laboratories in support of the project on coastal water quality control (MED VII) is hindered by the inability of many laboratories to carry out uniform methods of bacteriological sampling and analysis. Monitoring procedures in various countries still differ in response to requirements for national water quality control programs.

The individual projects are designed to enhance understanding of theoretical and applied aspects of pollution control through better communication among scientists. As the main element of the

Plan's assessment component, MED POL seeks to inform governments of the state of Mediterranean pollution and the costs of pollution control (*19*). This is intended to help the governments develop the capability to identify, monitor, and respond to pollution problems, as agreed under the convention.

Participating institutions have different views of the purpose of baseline studies and monitoring and of quality standards for sampling and analysis. This reflects the disparity in their scientific or educational goals and perhaps in their opinions regarding the competence of scientists. More regional institutions are willing to participate in baseline data gathering than in the more demanding task of analyzing biogeochemical cycling processes, transport of pollutants in river sediments, or accumulation of toxic substances. Also, their perception of the severity of the problem and thus their decision to participate in MED POL may be influenced by local experience with the physical or socioeconomic impacts of pollution.

How well are pilot projects serving to translate concern about specific pollutants into functional programs and institutions? One of the main pollutants in the Mediterranean, oil, is increasingly visible and threatening to coastal states. The Regional Oil Combating Center in Malta is a good example of an institution that benefits directly from a monitoring project (MED I). The center is a joint venture of UNEP and the Inter-Governmental Maritime Consultative Organization; it was opened in December 1976 to help countries develop the capability to respond to spills and to facilitate cooperation in case of a serious pollution event.

MED I, a joint project of UNEP and the Intergovernmental Oceanographic Commission (IOC), in cooperation with the World Meteorological Organization, provides funds for equipment, instrument intercalibration, and training in monitoring procedures to 25 laboratories in 11 countries. As the funding agency, UNEP enters into research agreements with laboratories. These laboratories observe oil slicks and tar balls, survey beaches for evidence of oil pollution, and gather water samples for analysis for dissolved hydrocarbons. The aim of the project is to assess current and predict future oil pollution levels in the Mediterranean, in order to facilitate contingency planning and the comparative study of Mediterranean oil pollution through the Integrated Global Ocean Station System monitoring program of the IOC (*19*, p. 7).

It is premature to judge whether MED POL projects are fulfilling their objectives equally well (*21*). Several factors appear to contribute to success. Monitoring projects that have an obvious relation to needs for environmental cleanup (for instance, of oil or heavy metals) capture public attention more quickly than research on toxic substances or ocean-atmosphere interactions. The standards applied to project design and implementation vary among the U.N. agencies that cooperate with UNEP. Other U.N. bodies are now taking environmental factors into consideration even without contractual or joint programming responsibilities to UNEP, and are coming to terms with the new demands on their resources arising from UNEP's coordinating role. Projects carried out by the World Health Organization (WHO), the Food and Agriculture Organization (FAO), and the International Atomic Energy Agency are of generally high quality. The quality of the projects also reflects the amount of interest of scientists from developed countries and their willingness to share their expertise with workers from developing countries.

Ultimately, the success of MED POL will depend on the effectiveness of the assessment phase in drawing attention to the advantages of long-run cooperation. Participation in the current pilot assessment may only reflect short-run political expediency. As long as UNEP is subsidizing projects it is relatively easy to maintain a regional consensus on the pollution threat; the situation may change when UNEP's financial contribution is reduced (*22*). At best, cooperation will enhance the regional capability to deal with relatively narrow technological and institutional aspects of pollution control and prevention.

Data problems. A recent National Research Council study (*23*) suggests that monitoring systems should be designed to anticipate (i) the purposes of data collection and their intended uses; (ii) data handling methods; (iii) problems in assigning institutional responsibilities for monitoring; and (iv) statistical and engineering principles to be used in the evaluation of results. As MED POL derives in part from monitoring activities that were under way before 1974, such considerations could not have been fully incorporated in its design, and this is a source of many unresolved problems, including lack of agreement on government and agency data prerogatives.

Arrangements for data acquisition, storage, and dissemination have been under discussion since the inception of the Plan, but questions concerning the confidentiality of data have yet to be resolved. The U.N. system has little experience with or interest in environmental data (*24*), and this is reflected in the ambiguity of UNEP's position regarding the handling of MED POL data. The official position of UNEP is that data should be considered unclassified (*25*). However, at a meeting to review the progress of MED POL in July 1977, scientists who attended recommended that "original data should be treated as confidential" and that "primary [raw] data should be processed by the participating research centres themselves." Data are still being processed mainly by participating laboratories rather than by a U.N. facility, and it is therefore difficult to evaluate the data provided by these laboratories. UNEP is trying to develop a MED POL data base using the Geneva-based U.N. International Computing Centre (*26*).

Achievements

What is special about the Plan? There is a growing pressure on natural systems due to the environmentally stressful effects of industrialization, resource exploitation, and population growth. Yet international cooperation in support of environmental research and more effective assessment and management is fragmented, largely ineffectual, and has low priority relative to other concerns. As an item on the global agenda, environment is clearly of less interest than security and disarmament, energy, food, the Third World's burden of debt, and the economic decline in Western industrialized countries. In the Mediterranean, however, much is being accomplished, even if tentatively.

The recent entry into force of the convention and two protocols is a real accomplishment. Perhaps of greater long-term significance, however, is the constructive role of the Plan in forging links among governments, scientists and scientific institutions, and international agencies in response to shared pollution concerns. In no other part of the world has this been accomplished to as great an extent.

Environmental protection is becoming more important for Mediterranean scientists and policy-makers as a result of their involvement in Plan activities. National policies are beginning to reflect awareness of interrelated aspects of pollution problems, and the technical re-

quirements of environmental control are modifying traditional ideas of collective responsibility and customary rights in water use, land tenure, and fishing.

Regional discussion has led to some modification of the procedures employed by governments and international agencies, which can facilitate their response to dumping and land-source problems. Despite the unresolved data management problems, the links between technical, administrative, and legal activities foster new approaches to gathering environmental data, and the research stimulated by the Plan enhances monitoring, risk assessment, and regulatory work. The potential for a multilateral response to specific pollution incidents in the Mediterranean has been improved. These activities are documented in Geneva by the Plan's coordinating unit.

The importance of documentation cannot be overemphasized. A persistent obstacle to the effective formulation of environmental policies has been lack of reliable data that are immediately relevant to standard setting or regulatory requirements. It is especially significant that the data obtained through Plan projects are intended as an information source for government policy-makers. Thus, national policies to protect the Mediterranean will derive eventually from region-wide scientific assessments based on common technical criteria, and these policies will be mutually reinforcing.

More generally, the Plan is helping to clarify the limits on the role of international agencies in environmental protection; the factors that promote or inhibit regional multilateral cooperation; and the connections between regional and global environmental assessment needs. This is useful at a time when there is growing interest in regional solutions to pollution problems among nations that have a common frontage on a semi-enclosed or regional sea (*27*). For example, the newly adopted (April 1978) Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution follows the organizational and legal format of the Mediterranean Action Plan. The governments in the Kuwait Action Plan Region (*28*) also agreed to a regional trust fund of $6.32 million for 2 1/2 years to support projects, a Marine Emergency Mutual Aid Center, and the establishment of a UNEP-staffed interim secretariat (*29*).

Even in areas where pollution is not yet a serious problem, governments acknowledge the advantages of cooperative scientific work. In May 1978 UNEP and IOC (with FAO and WHO) sponsored a meeting in Abidjan, Ivory Coast, for marine scientists from nine West African coastal states. The participants observed that the existing information on marine and coastal ecosystems could be used more effectively for pollution monitoring through exchange of personnel and data among laboratories. Implementation of a comprehensive action plan is not anticipated in the immediate future, but possibilities for joint response to pollution emergencies are being explored (*30*).

Since it is likely that a 200-mile exclusive economic zone will be adopted as part of a comprehensive Law of the Sea treaty, regional cooperation in controlling Mediterranean pollution takes on added significance. The legal basis for the jurisdiction of coastal states over pollution from offshore drilling, seabed mining, and shipping is not clear. Disputes over territorial sea boundaries, such as that between Tunisia and Libya, are common. The prospect of totally overlapping economic zones is a further inducement to regional cooperation (*31*). Yet, despite the progress under the Plan since Barcelona II, there is little likelihood that the Mediterranean states will be able to reconcile their differences through national legislation. UNEP is supporting a meeting in late 1978 to consider the legal aspects of pollution resulting from exploration and exploitation of the continental shelf, seabed, and subsoil in the Mediterranean. The meeting will be under the auspices of the International Juridical Organization and will explore the feasibility of developing a protocol on these matters (*25*).

The Plan in Broader Perspective

Since 1972, UNEP has been struggling to delineate its role as the U.N. agency charged with helping governments identify and respond to environmental problems. It has overall responsibility in the U.N. system for building an ecological dimension into diverse programs, coordinating the administrative and technical contributions of other agencies, and funding selected projects (*32*). There has been considerable discussion in the Governing Council and Secretariat of UNEP concerning the appropriateness of its direct involvement as funder and coordinator, in contrast to a more detached role as initiator of programs to help countries deal on their own terms with environmental matters.

This is reflected in the current debate over UNEP's Mediterranean role after 1979, when the pilot phase of MED POL is completed. The participating states are virtually unanimous in their support for UNEP's continued services as coordinator. The difficult issue is that of funding. In the Persian (Arabian) Gulf, oil-producing coastal states were quick to share financial obligations to support regional activities with UNEP. However, most Mediterranean participants cannot commit themselves at this time, and UNEP's other regional seas programs place increasing demands on a limited budget.

At the May 1978 meeting of the Governing Council in Nairobi, it was recommended that coastal states "take increasing financial responsibility for the secretariat costs, with the objective of assuming full financial responsibility . . . no later than 1983." States were also invited to submit proposals to UNEP to facilitate implementation of the Plan (*22*). It was agreed that if the coastal states would work out institutional arrangements for coordinating activities after 1983, UNEP would continue to fund Plan projects in cooperation with other U.N. agencies.

Experience with the Plan is serving to define the potential for management schemes for UNEP as much as for Mediterranean governments on whose behalf UNEP has been working. Through its leadership in the Mediterranean, UNEP is also supporting its wider mission by being able to assume a positive, forward-looking stance toward environment as a legitimate focus of global concern. Now that the emotional groundswell associated with the 1972 U.N. Conference on the Human Environment has subsided, attempts to coordinate international management and assessment programs in other priority areas have not been as successful.

Much remains to be done in the Mediterranean to make the transition from treaty commitment and cooperative monitoring and research to a fully institutionalized program. MED POL, which offers much promise as a comprehensive approach to monitoring with built-in training and evaluation components, is just beginning to produce enough data to permit region-wide assessment. The training function of the program is important. Although some governments are hesitant about permitting scientists to be involved in projects that reveal concentrated local pollution, all agree that assessment should serve as the basis for policy and derive from the combined efforts of scientists from developing and developed countries.

It may be unrealistic to expect com-

plete agreement on criteria for allocating environmental research, training, and management responsibilities in a cooperative program serving 17 Mediterranean states. The Plan demonstrates so far, however, that discussing scientific problems basic to an understanding of pollution can help to bridge sectoral gaps and develop a common sensitivity to complex regional issues.

References and Notes

1. The action plan format for international environmental cooperation originated in response to U.N. General Assembly resolution 2850 (XXVI), 20 December 1971, and was codified by the General Assembly in *An Action Plan for the Human Environment* (A/CONF 48/5, United Nations, New York, 1972).
2. Albania is the only Mediterranean coastal state that has not participated in Plan-related activities.
3. Initial reference to regional marine pollution monitoring needs appeared in U.N. Environment Programme, *Report of the Governing Council on the Work of Its First Session, 12–22 June 1973* [General Assembly, Official Records, 28th Sess., Suppl. 25 (A/9025), United Nations, New York, 1973], p. 43. Priority concern for Mediterranean pollution was emphasized in U.N. Environment Programme, *Report of the Governing Council on the Work of Its Second Session, 11–22 March 1974* [General Assembly, Official Records, 29th Sess., Suppl. 25 (A/9625), United Nations, New York, 1974], p. 113.
4. The emphasis may vary in different regions. In the Caribbean, marine pollution concerns were the initial focus of regional consultation. In 1976, a more comprehensive effort was undertaken to develop a joint project of UNEP and the Economic Commission for Latin America (the Carribbean Environment Project) for environmental management, focusing on development-related problems. The Pacific programs are in a preliminary planning stage [*Uniterra* **3** (No. 5), 8 (1978); *The Environment Programme* (UNEP/GC 6/7, U.N. Environment Programme, Nairobi, 1978), pp. 139–166].
5. National Research Council, *The Tropospheric Transport of Pollutants and Other Substances to the Oceans* (National Academy of Sciences, Washington, D.C., 1978), p. 2.
6. D. J. Stanley, Ed., *The Mediterranean Sea: A Natural Sedimentation Laboratory* (Dowden, Hutchinson & Ross, Stroudsburg, Pa., 1972), pp. xi-xii.
7. *Appraisal and Management of Fishery Resources: Situation in the Mediterranean and GFCM Activities in this Field* (UNEP/IG 5/INF 12, U.S. Environment Programme, Geneva, 1977); D. Charbonnier, *Ambio* **6** (No. 6), 376 (1977).
8. D. Middleton, *New York Times*, 6 May 1978, p. 2.
9. *Int. Environ. Rep. Curr. Rep.* **1** (No. 5), 143 (1978).
10. P. S. Thacher, *Ambio* **6** (No. 6), 308 (1977).
11. *Report of the Governing Council of the United Nations Environment Programme on the Work of its Fourth Session* (UNEP/GC/85, U.N. Environment Programme, Nairobi, 1976), p. 129.
12. U.N. Environment Programme, *Conference of Plenipotentiaries of the Coastal States of the Mediterranean Region for the Protection of the Mediterranean Sea, Barcelona, 2–16 February, 1976* (U.N. Office of Public Information, Geneva, 1976).
13. P. Dewhirst, *World Environ. Rep.* **4** (No. 4), 3 (1978). The first ratifications were by Spain, Tunisia, Monaco, Lebanon, Malta, Yugoslavia, Egypt, Syria, France, Israel, and the European Economic Community have since ratified the convention.
14. F. Barry, *ibid.* **4** (No. 5), 2 (1978).
15. *Int. Environ. Rep. Curr. Rep.* **1** (No. 3), 60 (1978).
16. *Pollutants From Land-Based Sources in the Mediterranean* (UNEP/IG 11/INF 5, U.N. Environment Programme, Geneva, 1977).
17. See also *Report on Industrial Wastes Discharged into the Mediterranean from Coastal Areas of ECE Countries* [U.N. Economic Commission for Europe (ECE), Geneva, 1977], pp. 1–5.
18. S. Keckes, *Ambio* **6** (No. 6), 327 (1977).
19. *Administrative Report on the Implementation of the Co-ordinated Mediterranean Pollution Monitoring and Research Programme (MED POL) and Related Projects of the Mediterranean Action Plan* (UNEP/IG 11/INF 3, U.N. Environment Programme, Geneva, 1977). There are currently 25 projects under the Mediterranean component of UNEP's Regional Seas Programme.
20. *Report of the Intergovernmental Meeting of Mediterranean Coastal States on the Blue Plan* (UNEP/IG 5/7, U.N. Environment Programme, Geneva, 1977).
21. A preliminary survey of Mediterranean pollution presented to governments at the January 1978 intergovernmental review meeting of Mediterranean coastal states on the Plan covers metals, petroleum hydrocarbons, and nutrients. Insufficient information was available on chlorinated hydrocarbons, radioactive materials, microbiological contaminants, and "other pollutants" such as litter.

21a. *Preliminary Report on the State of Pollution of the Mediterranean Sea* (UNEP/IG 11/INF 4, U.N. Environment Programme, Geneva, 1977). Most countries lack comprehensive data on industrial pollutants discharged into the Mediterranean. Monitoring is confined mainly to isolated point-sources, and ease of monitoring rather than toxicity, persistence, or distribution determines the choice of substances monitored (*17*, p. 3).

22. *Report of Sessional Committee I (Continued)* (UNEP/GC 6/L 8/Add. 2, U.N. Environment Programme, Nairobi, 1978), p. 17.
23. National Research Council, *Environmental Monitoring* (National Academy of Sciences, Washington, D.C., 1977), p. 23.
24. This is true despite UNEP's attempts to develop a Global Environmental Monitoring System (GEMS) in support of its Earthwatch global pollution monitoring exercise [C. E. Jensen, D. W. Brown, J. A. Mirabito, *Science* **190**, 432 (1975)]. Policies and procedures for handling and disseminating environmental data have not yet been fully considered by the U.N. Statistical Office.
25. *Report of the Intergovernmental Review Meeting of Mediterranean Coastal States on the Mediterranean Action Plan* (UNEP/IG 11/4, U.N. Environment Programme, Geneva, 1978), annex 3, p. 3.
26. *Report on the Mid-Term Review Meeting on the Progress of the Co-ordinated Mediterranean Pollution Monitoring and Research Program (MED POL) and Related Projects of the Mediterranean Action Plan* (UNEP/WG 11/5, U.N. Environment Programme, Geneva, 1977), pp. 6–7. See also (*19*), pp. 39–40.
27. C. H. Park, *Ocean Dev. Int. Law* **5** (No. 1), 39 (1978).
28. This comprises Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.
29. *Final Act of the Kuwait Regional Conference of Plenipotentiaries on the Protection and Development of the Marine Environment and the Coastal Areas* (U.N. Environment Programme, Geneva, 1978).
30. U.N. Department of Economic and Social Affairs, Office of Ocean Economics and Technology, unpublished information. See also Intergovernmental Oceanographic Commission, *Report of the IOC/FAO/WHO/UNEP International Workshop on Marine Pollution in the Gulf of Guinea and Adjacent Areas* (IOC Workshop Report 14, Unesco, Paris, 1978).
31. L. M. Alexander, *Am J. Int. Law* **71** (No. 1), 109 (1977).
32. I. Bloomfield, *UNEP and the U.N. System* (Publ. C/78-1, Center for International Studies, Massachusetts Institute of Technology, Cambridge, 1978), p. 6.
33. Lack of data or inconsistency and inaccuracy of existing data prevent a more detailed representation of pollution load by category (*17*, p. 3). Figure 1 is designed to show the relative intensity of the pollution problem around the Mediterranean. No attempt has been made to indicate the extent of open seas pollution. The map was adapted and modified from *FAO Gen. Fish. Counc. Mediterr. Stud. Rev. No. 51* (1972), map 1; *Le Bassin mediterraneen, Cadre geographique et socio-economique du Plan Bleu* (U.N. Environment Programme, Geneva, 1977), p. 84; C. Osterberg and S. Keckes, *Ambio* **6** (No. 6), 324 (1977); P. Sand, *Environ. Policy Law* **1** (No. 4), 156 (1975–1976). Metropolitan area populations in Fig. 1 are from E. Espenshade, Jr., and J. L. Morrison, Eds., *Goode's World Atlas* (Rand McNally, Chicago, ed. 15, 1978), p. 231; (*21a*), pp. 201–204; (*16*), annex I/1, pp. 1–10.
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