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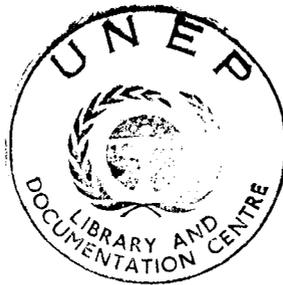
**THE STATE
OF THE ENVIRONMENT
1976**

**UNITED NATIONS
ENVIRONMENT PROGRAMME**





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FOREWORD

The report is based upon the viewpoints expressed in discussions with various members of the scientific communities on emerging environmental problems of wide international significance keeping in view the decisions of the Governing Council of the United Nations Environment Programme during its third session about the review of the environmental situation and of the activities relating to the environment programme. It was initially presented to Governments at the fourth session of the UNEP Governing Council, held in Nairobi in April 1976, and there was general agreement that the report accurately and realistically presented the most urgent environmental issues on which the international community in general and UNEP in particular should focus their attention.

The Governing Council of UNEP decided at its fourth session that in future the annual state of the environment report should be selective in its treatment of subjects and that an analytical, comprehensive report on developments regarding each of these issues should be prepared every fifth year. The first quinquennial State of the Environment Report of about 300 printed pages is expected to be completed by the end of 1980 for presentation to Governments at the session of the UNEP Governing Council to be held in 1981.

I. INTRODUCTION

1. By resolution 2997 (XXVII) of 15 December 1972, the General Assembly decided that the Governing Council of the United Nations Environment Programme should "keep under review the world environmental situation in order to ensure that emerging environmental problems of wide international significance receive appropriate and adequate consideration by Governments".¹

2. To assist the Governing Council in this task, the Executive Director prepares each year a report on the state of the environment. This is the third such report in the series. The two previous documents² discussed environmental factors (such as climatic change, the condition of the biosphere and the effects of toxic substances) human needs (including food, energy and raw materials) and social factors (including population growth, stress and social tension). Guided by the Governing Council's debate at its third session, the present report, while it again draws attention to unsolved problems in these fields, adopts an approach which places more emphasis on human needs and values. Chief among those human needs is the elimination of the evil of poverty which affects the majority of mankind, through modes of development which protect and enhance man's environment.

3. The report is selective. The information is not available to provide a comprehensive survey of the present state of the atmosphere, oceans, freshwaters and land throughout the world, and even if such a document could be prepared, it would be too technical and too voluminous for analysis by the Governing Council. Likewise, it is not feasible to describe the economic, social and cultural condition of every nation. What has been attempted is a brief but balanced summary of those major topics that merit discussion now. The report does not suggest solutions: it is designed to stimulate discussion from which solutions may emerge.

¹ United Nations Resolution 2997 (XXVII), "Institutional and Financial Arrangements for International Environmental Co-operation", 15 December 1972, Section 1, para. 2 (d).

² "The State of the Environment 1975"; *The State of the Environment 1974*, United Nations Environment Programme, Nairobi.

II. REVIEW OF THE STATE OF ENVIRONMENTAL PROBLEMS

4. The environment—defined as that whole outer physical and biological system in which man and other organisms live—is a whole, albeit a complicated one with many interacting components. The wise management of that environment depends upon an understanding of those components: of its rocks, minerals and waters, of its soils and their present and potential vegetation, of its animal life and potential for livestock husbandry, and of its climate. It demands positive and realistic planning that balances human needs against the potential the environment has for meeting them. Too many people think only of pollution when they consider environmental problems. Good management avoids pollution, erosion, and the wastage of resources by irreversible damage. To prevent such types of environmental degradation is even more challenging and certainly more efficient than to redress them after they had occurred.

A. MAN AND ENVIRONMENT

1. *The approach*

5. Like every other living being, man has specific biological needs. However advanced his civilization, he remains totally dependent on other forms of life for food, for the replenishment of the oxygen he breathes from the air and for the recycling of essential elements. But man's desires go far beyond his basic needs and make his requirements more complex and subtle than those of any other organism, just as his power to change the world greatly transcends theirs. How can this power be used to create development that will improve the conditions of life for the majority of the world's peoples and ensure that their environment is productive, healthy and pleasant to live in?

6. Both the creation and the recognition of environmental problems depend closely on the way society is organized, and on its values and objectives. Change in the relationship between man and his physical environment depend to a large degree on changes in the organization and aims of society. If man is to escape from a situation in which much energy and resources are devoted to correcting past mistakes, his aim must be to build a society which is intrinsically compatible with its environment.

2. *Basic human needs*

7. The fundamental needs of a human being are hard to define. Our perception of them varies according to our culture, time and technological progress. But some may be considered "basic" because unless they are sufficiently satisfied, dignified and active human life is impossible. They are food, shelter, health, clothing, education and creative productive work and they are felt by every human being irrespective of culture, race or sex. Closely linked with them there is another group of "social" or "cultural" goals such as entertainment, artistic and musical expression, participation in social affairs, travel, choice of employment and the like. It is hard to draw the line between human needs and desires. Once basic human needs are satisfied—and this in itself will be difficult to achieve throughout the world—people still have wants which relate to individual standards but also strongly reflect cultural influences. Aspirations and expectations mount as societies develop and economic growth proceeds: they are never fully attained. It is a feature of man that he is always searching for new goals—of knowledge, art, social choice, or physical quality of life. "Man wants to know", wrote Nasen, "and when he ceases to do so, he is no longer man." The statement applies to other quests than that for knowledge.

3. *The limits of the environment*

8. The greatest challenge of today is to design development so that it satisfies basic needs—beginning with the eradication of poverty—but is environmentally realistic and does not transgress the "outer limits" imposed by the capacities of the biosphere. These limits still cannot be defined accurately. It is easy enough to see that the earth is of finite size, receives a finite amount of radiation from the sun, has a finite potential plant productivity and in consequence can only meet the basic needs of a finite number of people. But we do not know what the "carrying capacity" of the earth is, or which factors are most likely to constrain the processes of social development. One thing is evident. The world is not environmentally uniform. Nations differ in their environmental resources. Some may always have to struggle against poor soils, unpredictable climates, or extremes of heat and cold, just as others lack indigenous energy resources or access to sea fisheries. No single solution will work everywhere, and development to meet basic needs and social aspirations will be much easier in some countries than in others. Some may never be fully self-sufficient in food, just as others see no way of becoming self-sufficient in energy or raw materials. Development will demand interdependence.

9. Different parts of the biosphere differ in their "resilience", that is their resistance to changes in the nature and intensity of human impact. It used to be thought that diverse and dominant systems like tropical forests were also relatively stable, while species-poor systems evidently under the continuing stress of a harsh environment, like the deserts, were

fragile. New research³ suggests that the relationship between diversity and stability is far less simple. In tropical forests a high proportion of the essential nutrients in the system is commonly present within the trees, and if cutting and burning disperses these nutrients and at the same time bares the soil to erosion, much of the fertility in the system may be rapidly lost. On the other hand the temperate zones of the world, with their more equable climate, have large areas where despite millennia of continuous agricultural use the robust soils remain fertile. These differences in the capacities of different systems to sustain their biological productivity when manipulated by man may set local outer limits to land development in various regions—or at least indicate which methods of development are most appropriate.

10. The concept of outer limits is sometimes also applied to pollution, and to the maximum amount of a particular substance man can discharge to air, land, freshwaters or ocean before unacceptable change ensues. Later sections of this report discuss the possibility that atmospheric pollution may cause climatic change and an increased hazard from ultraviolet radiation, which in turn will constrain development and the satisfaction of basic human needs. Behind such a debate lies a basic question: the environment has an undoubted capacity for dispersing the waste products of human societies which have used this capacity throughout history, but how legitimate is it to use that capacity when it is not possible to forecast all the effects of these emissions?

11. Not enough is known about the functioning of the world's environment and biological systems to permit confident quantitative predictions about these various constraints. More research is needed, especially on how to generalize from the existing detailed knowledge of many local situations to provide valid models of our diverse world. This is one of the chief aims of UNESCO's Man and Biosphere Programme.

4. *Social constraints*

12. The environmental inequalities in the world are paralleled by economic ones, which are a major obstacle to the satisfaction of basic human needs, especially in the developing countries, and a barrier to the harmonious development of mankind. Income inequality in developing countries distorts the production structure, which copies the systems found in the advanced countries and concentrates on meeting the demands of urban minorities whose income levels and consumption patterns are on a par with those of the middle and upper social sectors in developed countries. Scarce capital and technological capacities are thus diverted from meeting the basic needs of the bulk of the population, who live in poverty. Underemployment, inadequately using the human resources and

³ "Structure, Functioning and Management of Ecosystems", The Proceedings of the First International Congress of Ecology, the Hague (Netherlands) September 8-14, 1974, Centre for Agricultural Publishing and Documentation, Washington, 1974.

capacities of those countries, is one of the direct consequences and aggravates poverty and the deterioration of the human environment.⁴ Population growth under these conditions of low production and inadequate accumulation of wealth makes the situation worse.

13. The relief of the poverty affecting so large a part of humanity is hampered by the present concentration of the world's economic strength in the developed countries, and by the considerable waste of resources there. On the other hand, it is being increasingly recognized that much of the world's strength in unexploited natural resources is located in the developing countries—which lack the other necessary resources including technology to develop them fully for the benefit of their people. The declaration of the sixth special session of the United Nations General Assembly on a New International Economic Order is a move to correct this situation. Together with the Charter of Economic Rights and Duties of States, its implementation will probably demand more recognition of environmental problems and opportunities than has so far been forthcoming.

14. One area in which scarce economic resources are being wasted, and a potential environmental hazard larger than any other created, is the arms race, which continues despite efforts made in the United Nations and other international fora, and is even accelerating among the developing countries. The nuclear stockpiles of the major powers in 1974 amounted to some 30,000 megatons⁵ two million times the destructive capacity of the Hiroshima bomb. The group of powers with nuclear weapons has increased: in addition, about twenty countries which have not done so are in a position to make such weapons, using the plutonium produced by reactors installed to generate electricity.

15. The conventional arms race is no less flourishing. The military expenditure of the developing countries taken as a whole has grown at an annual rate of ten per cent since 1960.⁶ A large part of the scarce foreign exchange obtained through international trade has been used to increase military capacity rather than develop the environment or relieve the poverty of the population. The major powers actively foment this arms race, competing with one another to sell weapons. No less disturbing than the diversion of resources from the attack on world poverty to the arms race is the increase in the capacity of modern weapons to destroy both human life and the environment which sustains it. Recent wars have

⁴ D. C. Rao, *Urban target groups in Redistribution with Growth*, Ed. H. Chenery *et al.*, ed. (Oxford University Press, 1974); A. Berry, "Unemployment as a social problem in urban Colombia", Economic Growth Discussion Paper No. 145 (New Haven, Yale University Press); D. Mazumdar, "The problem of Unemployment in Peninsular Malaysia" (mimeographed, 1974, Washington, D.C.).

⁵ C. Norman, "After the Third World War", *Nature*, vol. 257, 9 October 1975, p. 439.

⁶ *Sipri Yearbook of World Armaments and Disarmaments 1968/69*, p. 19 as cited in *World Facts and Trends*, John McHale, ed. (MacMillan, 1972), p. 88.

shown the scale on which crops and forests can be destroyed: there is now the possibility of modifying environmental factors, such as weather and climate, for hostile purposes.

B. PROBLEMS

1. *Hunger*

16. According to World Bank estimates, in 1975 there were some 750 million people living in absolute or relative poverty (defined respectively by an income *per capita* below \$50 a year, or below one third of the average *per capita* income in the nation to which they belong). A recent United Nations survey indicates that half the people in the world suffer from hunger or malnutrition or both.⁷ Some estimates suggest that to feed the present population of the world adequately, global food production should be doubled. In the meantime, since 1961 world food reserves have fallen from a supply sufficient for 95 days to only enough for about a month.⁸

17. It is estimated that at present there are 4 births and 2 deaths every second. The 3.7 billion people in the world in 1972 had increased to 4 billion by 1975 and are expected to exceed 7 billion by 2000.⁹ Present food production needs to be multiplied by four if the basic needs of all these people for food are to be met. A vigorous programme aimed at achievement of basic human needs in all countries may enable the world population to stabilize much earlier than now expected, since birth rates tend to fall with increasing well-being.

18. The zones of the earth that are naturally fertile, with robust soils and equable climates, are already very largely occupied. There are only limited new lands to cultivate, and at present the gains from this source are balanced, and may even be exceeded by, the loss of farmland through erosion, aridity, salinity and urban encroachment.¹⁰ It may still be possible to achieve reasonable increases in world fishery catches,¹¹ through exploiting new waters and species, but on land the additional food production needed must come largely from using the areas of present agriculture better, and checking degeneration into desert. Spectacular "break-throughs" are rare in science and startling advances cannot be

⁷ R. Arvill, *Man and Environment*, Penguin, England, 1974, p. 17.

⁸ J. Gribbin, "Climate and the World's Food", *New Scientist*, vol. 64, 28 November 1974, pp. 643-645; P. Collins, "Facing the Facts About Food", *Nature*, vol. 256, 10 July 1975, p. 85.

⁹ R. Arvill, *Man and Environment* (*op. cit.*), p. 207.

¹⁰ "Overviews in the Priority Subject Area; Land, Water and Desertification", United Nations Environment Programme, Nairobi, Prog/2; p. 28; R. Arvill (*op. cit.*) pp. 30-33.

¹¹ J. A. Gulland, in *Antarctic Ecology*, M. W. Holdgate, ed., Academic Press, 1970.

expected, but a great deal of research is going on. Only about 5 per cent of the energy reaching the earth in the form of sunlight is absorbed by vegetation, and the process of production of edible food by plants, and its conversion to animal protein, is not very efficient. New strains or species better adapted to "fringe" habitats than existing domesticated plants and animals, and changes in dietary habits that eliminate much of the wastefulness in the developed countries today, may help. Enhanced production will certainly demand the extended but careful use of irrigation, fertilizers and pesticides. New types of nitrogen fertilizers are being developed which release their nitrogen into the soil as nitrate during the growing season at a rate comparable to the crop's demand. Biological means of enhancing soil fertility, for example through the inoculation of the ground with nitrogen-fixing bacteria, may be developed. Integrated pest management, blending ecological, habitat, biological and selective chemical agents of control, is being explored. Improved forecasts of weather and climate would be of immense benefit in agricultural operations and planning. The efforts to determine and attain the theoretical limits of such forecasts being made under the Global Atmospheric Research Programme and the World Weather Watch should be intensified. Mathematical models that improve the accuracy of crop yield forecasting, taking account of weather and climate are also needed.

19. With all these developments, it is reasonable to be optimistic about the prospects of feeding the foreseen world population—at a better standard than prevails in many places today. But there is need for caution. First, modern intensive agriculture costs energy—fossil fuel energy employed in making implements, fertilizers and pesticides. Secondly, the fertilizers and pesticides employed can have unwelcome side-effects. Thirdly, the distribution of the products to those that need them is costly—in recent years these distribution costs have been rising twice as fast as production. Fourthly, the technology for improving agriculture may exist, but its actual effectiveness depends on the training of the farmers, especially in the developing countries. Finally, something must be done about the high wastage of food in transport and storage. In Africa the annual losses in storage are equivalent to the food requirements of 250 million people. In the United States the losses cost \$100 million per annum.

2. *Pollution and world climate*

20. The climate of the earth depends on a complex system of interactions, and a relatively small change in one of the controlling factors could conceivably produce climatic changes which would have serious consequences for mankind, hampering the increase in world food production that is so vital to the fight against poverty. During recent decades there has been much discussion of the possible effect on climate of the rising carbon dioxide content of the atmosphere, caused by the burning of fossil fuels, and of changes in atmospheric turbidity caused both by

natural events such as volcanic eruptions and by human activities. More recently concern has also been expressed about the possibility of a reduction in the amount of ozone in the stratosphere.

21. A recent report by WMO,¹² prepared in collaboration with UNEP and ICSU, concludes that supersonic civil aircraft, of the type and in the numbers now planned, are unlikely to cause a significant reduction in ozone levels. On the other hand a continued release of chlorofluoromethanes (widely used as a propellant for sprays and as refrigerants) could have an appreciable effect. Furthermore, there have been recent suggestions that both the present processes for the manufacture of nitrogenous fertilizers and the behaviour of those fertilizers in use could increase the amounts of nitrous oxide entering the atmosphere, with additional effects on ozone levels. We depend on this ozone as a screen against ultraviolet radiation from the sun, which can cause skin cancers in man, and other biological effects. An increased penetration of the atmosphere by this radiation could also have effects on climate.

22. The fight against poverty depends on increased food production and the increased generation of energy (the environmental effects of energy generation are the subject of document UNEP/GC/61/Add.1). At present most of mankind's energy needs are met by burning wood or fossil fuel. If this is to be done on a greater scale, what the possible consequences are for world climate and biological productivity, both through the general influence of the carbon dioxide and particulates released and the more local impact of waste heat, must be ascertained. If nuclear energy is to replace fossil fuel energy sources, again the environmental consequences need to be thoroughly evaluated in advance. If the present system for making or using essential fertilizers is likewise capable of damaging side-effects, it is important that these be appraised now. To double world food production may require more than a doubling of fertilizer and pesticide production. It is important that we do not take away with one hand what we create with the other.

23. Environmental systems are very complex, and there is not enough evidence to indicate with certainty that the problems described above are real ones or to quantify their scale. For this, more work involving several United Nations agencies and other international organizations, is required—urgently.

3. *Pollution and people*

24. Pollution that affects the climate also affects everybody, everywhere. Most pollution problems, in contrast, remain localized, and their seriousness depends very much on the way of life people have. In developing countries undernourishment, malnutrition and the infectious diseases associated with poor environmental sanitation, contaminated

¹² "WMO Statement on Modification of the Ozone Layer due to Man's Activities", World Meteorological Organization, Geneva, WMO/No. 315, 6 January 1976.

water supplies, and inadequate control of disease vectors, separately or in combination, still cause great suffering and waste of life. Efforts here have rightly been devoted to improving basic environmental health. As development proceeds, new environmental health problems related to urbanization, industrialization and the ways of life that go with them assume increased importance.

25. According to United Nations estimates,¹³ 3,103 million out of the 7,253 million people expected in the world in 2000 will live in towns and cities. Of this urban population, 1,996 million (64.3 per cent) will live in developing countries. In 1950 there were only 70 cities with a million or more inhabitants in the world; today there are about 84 in the industrialized countries and 74 in the third world. By 2000 it is estimated that there will be 276 such cities in the third world alone.¹⁴ Cities grow in two ways: through the increase in their indigenous population and through migration from rural areas where the land is fully occupied and there are insufficient non-agricultural jobs. Natural increase of urban population is estimated at about one third of the total increase; the rest is through immigration from the countryside. Opportunities for the poor are generally better in urban than in rural areas,¹⁵ but nonetheless there are many cities in the world where large numbers of people endure poverty, over-crowding, and the pollution that these cause. If urban development is going to accelerate over the coming decade, more attention must be given to planning so that these bad conditions are not extended.

26. As development proceeds, the variety of chemical and physical hazards to which people are exposed increases rapidly.¹⁶ Industrial exposure to toxic materials, and, more generally, exposure to food additives and contaminants, emerge as considerable potential problems. It is possible that a substantial proportion of the cancers prevalent in developed countries results from low level exposure to such substances over long periods. Another problem of urban and industrial areas is noise. Although more information is needed about its effect, noise clearly makes a major contribution to the psychological tension which people who live in such environments suffer. Urbanization also demands increasing amounts of energy, and can cause social disruption and stress if it is not very carefully planned.

27. All these issues are of pressing importance, for the actions taken in the next decade will determine the quality of the urban environment forty per cent of the world's population may be inhabiting at the end of

¹³ Trends and Prospects in Urban and Rural Population, 1950-2000, as assessed in 1973 and 1974 (ESA/P/WP.54, 25 April 1975).

¹⁴ Trends and Prospects in the Populations of Urban Agglomerations, 1950-2000, as assessed in 1973-1975 (ESA/P/WP.58, 21 November 1975).

¹⁵ "Urban Slums and Squatter Settlements in the Third World", United Nations Conference on Human Settlements, Regional Preparatory Conference, Teheran, A/Conf.70/RPC/9, 15 May 1975.

¹⁶ "WHO's Human Health and Environment Programme, Progress and Future Development", World Health Organization, Geneva, A29/11 Annex EB57/23, 4 December 1975.

this century. A considerable scientific effort, especially in WHO, is needed in order to ensure that development plans are designed to provide the best attainable environmental health. More attention needs to be given to positive strategies that create urban centres of the "right" size. In many developing countries there are not enough resources to provide jobs, education and health services throughout the rural zone, but it may be possible to provide them in townships of intermediate size in such regions, thereby stemming the drift to the great cities. If services and employment are distributed in a way that takes account of environmental circumstances, people can be attracted to places where their basic needs can be met and their energies most effectively harnessed.

C. TOWARDS THE BETTER MANAGEMENT OF THE ENVIRONMENT

1. *Analysis of the problem*

28. Because of the oneness of the environment, even the most local environmental problems must be seen in global terms and from the point of view of their long-term consequences. However, the world is heterogeneous, both in its natural environmental features and in the pattern of human social development, and it thus follows that very few environmental problems can have global solutions. Even those that have—like the possible impact of pollution on climate or on the ecology of the oceans—while they need to be recognized internationally, can only be solved by action at the national or local level. In the end, solutions come from individual people doing something different.

29. The satisfaction of man's basic needs, and the development of communities that go further and satisfy social aspirations, will demand a growing amount of energy and natural resources. The volume of this demand will depend not only on population growth, but also on the style of development adopted. Even today, if waste were eliminated and economic strength distributed more evenly, poverty in the world could be greatly reduced. On the other hand, the uncritical adoption of inappropriate styles of development can add to the waste of resources. The present way of life and consumption patterns of the developed countries are not sustainable, and accordingly are not the best for other States, even if they could be afforded in a world whose resources are limited. It is certainly worth avoiding the pollution and stress that such countries have experienced. A major effort is needed to study new technologies and new development strategies for both developed and developing countries.

30. The first need is to assess the present state of the environment in each area, and evaluate the alternative patterns of development that could be followed, what each would cost in terms of money and human effort, and how far each alternative would provide benefit. Methods of environmental survey and evaluation, leading to predictive models, are

a concern of UNESCO's Man and Biosphere programme, of FAO, and of other international organizations. Part of this work may lead to the development of simple, comparable and widely useful indices or indicators.

31. Because the world is heterogeneous, a degree of specialization in the products of each country is inevitable, and has been a driving force of world trade and economic growth from early history. Few nations are likely ever to be wholly self-sufficient. For most, there will need to be a degree of sharing, either through regional international associations or through wider trading links. Economic models are useful in working out the best patterns to follow, but for such models to be implemented world tensions will need to relax. Nations will need to appreciate that the world is their common environment: that trans-frontier pollution and unilateral over-exploitation and manipulation of shared resources must be avoided, even if such action would help meet a short-term economic interest.

32. Natural environmental systems are not 100 per cent efficient, and human organizations cannot expect to be either. But if mankind is to succeed in the fight against poverty, needless waste resulting from international jealousies cannot be afforded. Environmental science can state what can and cannot be done, and predict the outcome of alternative human actions. Only political will can ensure that foolish actions are avoided. This can be achieved if the international community gives adequate attention to environment at discussions like those pertaining to the implementation of the New International Economic Order and the General Assembly resolution 3362 (S-VII) on development and international economic co-operation.

2. Action at the international level

33. The air and the oceans are, as many UNEP documents have stressed, the most international of all environmental resources. In the past year action to develop the Global Environmental Monitoring System (GEMS), needed to inform the Governing Council through UNEP of the scale and trend of global pollution, has advanced. The WMO programme for measuring background pollution is being expanded, and the participation of developing countries encouraged. Monitoring of oil pollution along shipping lanes is being carried out under the IGOSS pilot project on marine pollution. WHO and WMO are collaborating to co-ordinate air pollution monitoring in a number of cities. FAO is also continuing a major project on the monitoring of world fishery resources. UNEP in co-operation with FAO has already embarked on the first steps towards monitoring of soil degradation and changes in the tropical forest cover.

34. Action to protect the sea took a step forward with the coming into force of the London Convention on the Prevention of Marine Pollution by the Dumping of Wastes and other Matter, and the development

of the Mediterranean Action Plan (referred to in detail in document UNEP/GC/61, chap. IV). The enclosed and shallow seas of the world are under greater pressure from man than the deep ocean, because they receive the pollution discharged from the land, because most fisheries are in the shallower waters and because here offshore oil exploitation is concentrated. Regional international agreements to combat the pollution or overfishing of such seas are clearly desirable, and the action taken in the Baltic, the North-East Atlantic (under the Oslo and Paris Conventions) and now the Mediterranean needs to be followed more widely, especially if the ongoing revision of the law of the sea extends the jurisdiction of coastal States in such waters.

3. *Success at the national level*

(a) *Cleaning the air*

35. In highly industrialized countries and regions, there are three main sources of air pollution—houses, industry and vehicles. In the United Kingdom, coal smoke from houses used to be the greatest problem but changes in the fuel available, and legislation to compel people to burn smokeless materials in urban zones, have led to a dramatic reduction in smoky fogs and a 50 per cent increase in winter sunshine in London, Glasgow and similar centres. It has become worth cleaning the stonework of public buildings, because they stay clean. Public health has also improved, and hospital admissions have not been swelled by smog in London since 1963. In other countries control of vehicle emissions has been of higher importance: stringent standards in the United States have begun to cure the notorious oxidant smogs of Los Angeles and other cities,¹⁷ while controls on vehicles entering central areas of such cities as Siena, Pisa, Florence, Rome, Milan, Munich, Nuremberg and Dusseldorf have not only improved the quality of city life but aided in the conservation of historic buildings. Industrial air pollution has also been increasingly curbed in developed countries, both by better technology, leading to cleaner emissions, and by the construction of tall chimneys to secure better dispersion. Sulphur oxide pollution at ground level in cities in the United Kingdom has fallen by 30 per cent in the past decade,¹⁸ but it is worth noting that the “tall chimney” dispersion policy which has provided this benefit is not without problems, for it has been suggested that it may increase the amount of acidic gas and rainfall affecting vegetation at a distance from the chimney. An international research programme is examining this issue.

¹⁷ R. Arvill (*op. cit.*) pp. 97-99.

¹⁸ Royal Commission on Environmental Pollution, First Report, “Environmental Pollution”, 1971, Cmnd. 4585; Third Report, “Pollution in some British Estuaries and Coastal Waters”, 1972, Cmnd. 5054; Fourth Report, “Pollution Control: Progress and Problems”, 1974, Cmnd. 5780, Her Majesty’s Stationery Office, London.

(b) *Rivers and lakes*

36. Waterborne diseases such as cholera, typhoid and enteric fever, which killed many people in Europe in the nineteenth century, have now been reduced to insignificance there through improved sanitary and water supply conditions. More recently, China has virtually eradicated schistosomiasis which before 1959 affected about 10 million people. This has been done by chemotherapy and by environmentally sound techniques, including the provision of clean domestic water supplies and the destruction of the snail, which is the host of the disease, through alteration of its habitat.¹⁹ In many countries attention has turned from disease control—obviously the first priority—to enhancement of the freshwater environment. In North America, bilateral agreement between the United States and Canada is guiding action to restore the ecological systems of the Great Lakes.²⁰ In the Soviet Union Lake Baikal, one of the most remarkable freshwater bodies in the world, is being protected by new effluent control policies.²¹ The Moscow River, like many rivers in Western Europe and North America, is benefiting from new and stringent effluent controls. A convention designed to improve water quality in the shared rivers of Europe has been negotiated in the Council of Europe, and other measures are afoot in the European Economic Community and under the Rhine Commission. In London, because new sewage treatment works have been built, the tidal Thames is no longer deoxygenated in summer, and over fifty species of fish have returned to its waters.²²

(c) *Conservation*

37. The word “conservation” is commonly misused and misunderstood. In its widest sense it means the wise management of natural resources so as to sustain their productivity—in whatever form this is sought. It embraces the maintenance of soil fertility, protection against erosion, the retention of forest cover on hillsides that would wash away were it removed, the protection of the genetic diversity of the world, which provides a pool from which new strains of crop and livestock may be derived, and the protection of samples of natural ecosystems for education, research or human enjoyment. In these terms, conservation is not to be thought of simply as the protection of wilderness for the pleasure of the affluent, but as a policy which is inseparable from the rational use and management of the world environment. Often it includes policies of environmental enhancement.

¹⁹ L. E. Obeng, “Report on Study Tour on the Control of Schistosomiasis in Peoples Republic of China”, October 28–November 18, 1975, United Nations Environment Programme, Nairobi.

²⁰ “Fifth Annual Report of the Council on Environmental Quality”, US Government Printing Office, Washington, 1974, p. 455.

²¹ E. K. Fedorov, “Interrelation between Man and Environment” (in Russian) (Gidrometeoizdat, 1973).

²² Council on Environmental Quality. Reports.

38. In China there are areas formerly devastated by deforestation and overgrazing and converted into sterile sand dunes. In Liaoning Province and Chang Wu County 100,000 out of 150,000 hectares of such wilderness have been restored for afforestation and agriculture. In other parts of the world, FAO is actively encouraging reafforestation of land unwisely cleared in the past, where vegetation cover is essential to retain soils and control water run-off, besides providing wood.

39. In many areas, land not suited for intensive agricultural use can yet contribute to national well-being under forest or other types of natural vegetation, provide useful plant and animal products, and conserve genetic resources and something of the richness and natural beauty of the earth.²³ In the past year not only have new national parks on land been declared in many countries, but many marine areas with rich faunas and floras and high scientific interest have been set aside.²⁴ Five such have been declared in Iran, 24 identified in the Persian Gulf, and 22 in India, Pakistan, Sri Lanka, Kenya, Somalia and the United Republic of Tanzania. Six areas have been recommended in the Red Sea and the Gulf of Aden, while other areas around Pacific islands have been safeguarded.

(d) *Education and training*

40. The experience of the "green revolution", for example in India, showed that new strains of crop, new schemes of irrigation and other aids to good husbandry succeed only if they are put in the hands of people who are properly trained and organized to use them. In India a novel Satellite Instructional Television Experiment (SITE) has begun recently.²⁵ A village provided with a television set and accessories (costing about \$700), even if it has previously been untouched by modern technology, can tune into programmes in its own language giving local news, entertainment, and instruction on family planning, nutrition, agriculture and education.

²³ R. van Osten, *World National Parks, Progress and Opportunities*, Hayez, Brussels, Belgium, 1972.

²⁴ R. Allen, "Marine Parks: the Cinderella of Conservation", *New Scientist*, vol. 67, 14 August 1975, pp. 366-369.

²⁵ B. Maddox, "India's Schoolroom in the sky", *New Scientist*, vol. 67, 7 August 1975, pp. 332-334.

III. LEGAL AND INSTITUTIONAL ARRANGEMENTS

A. CONVENTIONS

41. As a result of recent ratifications by a number of States, seven important global conventions have come into force in 1975. These are:

The Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973,

The Convention on Wetlands of International importance especially as Waterfowl Habitat, 1971,

The Convention concerning the Protection of the World Cultural and Natural Heritage, 1972,

The International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties, 1969,

The International Convention on Civil Liability for Oil Pollution Damage, 1969,

The Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, 1973, and

The Convention for the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972.

42. The information regarding the status of other conventions in the field of the environment is contained in document UNEP/GC/61/Add.2.

43. It will be recalled that the Third United Nations Conference on the Law of the Sea has been engaged in a major global legislative activity aimed at a comprehensive regulation of the Law of the Sea including the preservation of the marine environment. At its third session held in Geneva in 1975 a single negotiating text was prepared by the chairmen of the three committees of the Conference and included several draft articles relating to the preservation of the marine environment.

44. At the regional level, a Conference of Plenipotentiaries of the Coastal States of the Mediterranean region was convened by UNEP from 2 to 13 February 1976 to conclude on the basis of draft articles previously prepared by legal and technical experts, three important legal instruments relating to the protection of the Mediterranean Sea. These are:

(a) Draft framework convention for the protection of the marine environment against pollution in the Mediterranean ;

(b) Draft protocol for the prevention of pollution of the Mediterranean Sea by dumping from ships and aircraft;

(c) Draft protocol on co-operation in combating pollution of the Mediterranean by oil and other harmful substances in cases of emergency.

B. ENVIRONMENTAL MACHINERY

45. Most countries have established their own environmental machinery in one form or another. These countries can be divided into the following two groups:

(a) Countries with separate environmental agencies;²⁶

(b) Countries which divide environmental responsibility among various agencies and ministries.²⁷

Some countries have both of the above, but the lists reflect the type of agency which bears most responsibility or makes the policy decisions. A few of the countries which do have environmental machinery did not reply to the UNEP questionnaire about the existing arrangements in such countries.²⁸

²⁶ Algeria, Argentina, Australia, Austria, Benin, Brazil, Bulgaria, Byelorussian Soviet Socialist Republic, Canada, Central African Republic, Chile, China, Colombia, Czechoslovakia, Denmark, Egypt, Finland, France, Gabon, German Democratic Republic, Germany (Federal Republic of), Ghana, Honduras, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kenya, Korea (Democratic People's Republic of), Kuwait, Liechtenstein, Luxembourg, Malaysia, Malta, Mauritius, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Norway, Peru, Philippines, Poland, Portugal, Romania, Senegal, Singapore, South Africa, Spain, Sudan, Sweden, Switzerland, Ukrainian Soviet Socialist Republic, United Kingdom, United States of America, Upper Volta, Uruguay, Yugoslavia, Zaire.

²⁷ Bahrain, Bangladesh, Botswana, Cyprus, Democratic Yemen, Ethiopia, Greece, Iraq, Malawi, Maldives, Mongolia, Nicaragua, Niger, Pakistan, Panama, Qatar, Rwanda, Sri Lanka, Swaziland, Syrian Arab Republic, Trinidad and Tobago, Turkey, Union of Soviet Socialist Republics, United Republic of Cameroon, United Republic of Tanzania, Zambia.

²⁸ Brazil, France, Mexico.

IV. CONCLUSIONS

46. Man cannot be considered in isolation from his environment. Over the world, the needs of people still differ enormously. At one time the environmental problems debated in international organizations would predominantly have been those recognized by the developed countries—the need to control pollution and the desirability of conserving samples of the ecological and genetic richness and the natural beauty of the earth. Since the United Nations Conference on the Human Environment, however, it has been increasingly realized that environmental issues are also of vital concern to developing countries and that over much of the world the environmental problems are still those associated with poverty—poor housing, bad public health, malnutrition and inadequate employment.

47. These problems can only be solved through development. But that development, producing more food and drawing on the still great resources of the planet, needs to be environmentally wise, and to be based upon thorough evaluation of the potential uses of the different regions of this highly variable earth. Short-term solutions may all too easily—as they have in many countries—lead to long-term losses which a growing world population cannot afford.

48. Scientific study can guide development. It is unlikely to provide a magic formula through which all nations can attain the same standard of living at the same cost in economic or human terms. Because the world is heterogeneous, nations will continue to differ in their ways of life and in the ease with which they can maintain the basic standard of living their people demand. The diversity in the world environment has also added to the richness of human experience by evoking differently adapted ways of life in different places, and is likely to continue to be reflected in the detailed pattern of development.

49. There are enough success stories to show that much can be done, in countries with very different political and ideological systems, to improve the quality of the environment. Probably the only pollutants still increasing in the world are those whose hazards to man or other forms of life have not yet been demonstrated. Science, linked to monitoring, is needed to ensure that new pollutants do not create unrecognized hazards. International schemes to screen such substances before they come into widespread use are a welcome recent development. Science can also guide environmental management by defining potentials for land use under different conditions.

50. International collaboration, on a scale not seen so far in the history of the world, is essential if mankind is to meet basic human needs and, at the same time to safeguard the environment for future generations. The recent ratification of a number of important global conventions on matters relating to the environment is an encouraging sign in this respect. Moreover, the interest Governments have shown in environmental matters, demonstrated by the establishment of national environmental machinery in many countries, is further evidence of concern for environmentally sound development. This is important because some countries at present using a disproportionate share of the earth's resources may need to learn to do with less, and use what they consume less wastefully, as part of this process. There is nevertheless still a danger at both national and international levels, that Governments will use the inadequacies of present knowledge as an excuse for deferring action that can and should be taken now, but which may demand the adjustment of cherished policies. Without political will science can do nothing. The essence of the environmental challenge, therefore, is political rather than technical.