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1976 Annual Review

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United Nations Environment Programme

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"the environmental conscience of the United Nations"

1976 Annual Review

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Preface by the Executive Director

The first annual review of the United Nations Environment Programme, for the year 1975, had as its aim not so much a review of the development of that year, as an introduction of UNEP to the reader. This issue seeks to fulfil the more customary purpose of an annual review, and represents a progress report on what was done by UNEP in 1976 to achieve the overall world environment goals enunciated in 1972 at Stockholm.

As in all annual reviews, the events described in it will have been swiftly outdistanced by further developments since the end of 1976. It is like a still photograph of a flowing river. Nevertheless, I believe such reviews will have increasing value as the years go by.

For one thing, in studying a river one should look at its origins. Many streams of environmental concern were united at Stockholm, where UNEP was conceived. And it is important to have a record of the course UNEP has taken since the General Assembly of the United Nations established it along the lines recommended at Stockholm. The annexes of this review provide much background information to help keep the ongoing work of UNEP in perspective.

A river flows somewhere, but it does not cease to exist when it attains its ultimate objective. The continuing aim of UNEP, as enunciated by the General Assembly in December 1972, must be to "ensure that emerging environmental problems of wide international significance receive appropriate and adequate consideration by Governments". This translates itself into care and concern not only for the world environment as such, but for the preservation and enhancement of its ability to respond on a continuing basis to the needs of human communities as they learn better how to occupy their own niches in the world ecosystems of which they are part. In other words, the ultimate objective of UNEP is a better life for all, by respecting the facts of life—all life—on this planet.

UNEP in 1976

Introduction

This is the second Annual Review of the United Nations Environment Programme; it reports on the fourth year of the life of UNEP—1976. As will be seen from the pages which follow, 1976 was an eventful year for UNEP.

The first Executive Director, Mr. Maurice F. Strong, resigned his post with effect from 31 December 1975, and the present Executive Director, Mr. Mostafa K. Tolba, was elected by the General Assembly, at its 30th session, to fill the 12-month unexpired portion of Mr. Strong's term of office. Towards the end of 1976, the General Assembly, at its 31st session, re-elected Mr. Tolba for a full four-year term, 1977-80.

It was a year of steady progress for the still-young Secretariat. The objectives and strategies of the Environment Programme having been defined at the third session of the Governing Council in 1975, the fourth session of the Governing Council, meeting in April and May 1976, reviewed the institutional arrangements for international environmental co-operation. These arrangements, which were established by the General Assembly in 1972 (resolution 2997 (XXVII)) were considered by the Council to have proved adequate and sound—a view subsequently confirmed by the Economic and Social Council and the General Assembly.

During 1976 closer relations were established with Governments. The number of Permanent Representatives of member states accredited to UNEP stood at 40 at the year-end, as compared with 23 a year earlier; communications between the Secretariat and Governments were also facilitated by the publication of *Report to Governments*. An ambitious cycle of joint programming discussions with United Nations organizations was launched under the aegis of the Environment Co-ordination Board to identify principal areas of mutual concern and to plan co-operative programmes for the advancement of the environmental cause in them. Contact with non-governmental organizations were greatly enhanced as a result of joint activities between UNEP and the Environment Liaison Centre based in Nairobi, while UNEP's monthly newsletter, *Uniterro*, and other information material published in 1976 helped to increase public awareness of global and national environmental issues.

In programme terms, this Annual Review relates a number of important initiatives in such varied fields as Earthwatch and environmental law, and in the development and articulation of fundamental concepts, such as the intricate relationship between the environment and

development, including the pursuit of basic human needs through environmentally-sound development strategies, all of which will be important UNEP concerns for many years to come. Perhaps the single most important achievement in the UNEP programme is related to the Mediterranean Region, which is described in some detail later in the Review; it demonstrates tangible application of UNEP's co-ordinating and catalytic role. The Review also records a most significant event in the area of human settlements: Habitat, the United Nations Conference on Human Settlements, which was held in Vancouver, Canada, with support from UNEP.

Accomplishments during the year can, in certain respects, be reflected in financial terms. Income to the Environment Fund in terms of voluntary contributions from Governments amounted to the equivalent of \$23,479,555 (as at 31 December 1976) bringing the paid-in total for the four-year period 1973-6 to \$69,032,687. Eighty-four new projects were approved during the year for assistance by the Fund, requiring a UNEP investment of \$23.5 million, which brought the four-year total of commitments for Fund Programme Activities to \$69,834,172 and the total number of Fund projects approved during that period to 444. However, because of uncertainties in the financial future of the fund in the first half of 1976, there was a brief pause in launching new activities; but this delay was only temporary.

In this, and many other ways, readers of this Review will find an account of a rapidly-maturing organization, increasingly well-adapted to achieving the aspirations of the international community in the Stockholm Declaration.

A. Activities arising out of major decisions made at UNEP's fourth session of the Governing Council*

The Governing Council of UNEP, comprising 58 member states, meets annually. At its fourth session, held in April 1976 in Nairobi, the Council adopted decisions on different aspects of UNEP's work which were carried out. They included:

(i) *Approval of the Programme*—the Council approved of the action taken and planned on UNEP's priority areas and functional tasks** and the Executive Director pursued the programme in 1976 along the same lines.

*For the full list—see Annex C.

**See Highlights of the Environment Programme for priority areas and functional tasks.

Other important matters affecting parts of the programme included:

Preparations for the 1977 United Nations Water Conference—UNEP continued to participate in and to support financially the preparations for this conference, with the emphasis on the environmental aspects of water use as recommended at Stockholm in 1972;

Earthwatch—UNEP began planning an integrated evaluation programme and interdisciplinary research programme as interacting component parts of "Earthwatch" along with the Global Environmental Monitoring System (GEMS), the International Referral System (IRS) and the International Register of Potentially Toxic Chemicals (IRPTC);

The Ozone Layer—the Executive Director prepared to convene an international meeting to discuss the risks to the ozone layer arising from atmospheric pollution, and hold it jointly with the United States Government in 1977, Washington;

Environmental Law—UNEP continued to co-operate with the existing activities in matters such as collection, analysis and presentation of relevant data in the field of environmental law;

Environment and Development—the Executive Director studied more closely the relationship between environment and development, including research into development of appropriate institutions, and made arrangements to convene regional and sub-regional inter-governmental meetings and seminars. With the authority of the Governing Council, the Executive Director convened an inter-governmental expert group meeting in 1976, and will submit a report to the fifth session of the Governing Council in 1977.

(ii) Other decisions included one on *the State of the Environment Report*, a major annual document which, from 1977, will deal with selected subjects. For 1977 the subjects are: the ozone layer, environmental cancers, firewood, land and soil loss. A more detailed report will be produced every fifth year on progress made on each topic selected within the five-year period.*

On *Basic Human Needs and Outer Limits*, the Council felt that today's biggest challenge is to design development yet protect environmental quality and respect the Earth's outer limits while satisfying basic human needs, particularly by eradicating poverty.

On *allocation of funds*, the Council allocated the sum of \$34 million for Fund programme activities in 1976 and \$35.7 million in 1977. Of this, over \$6 million was to be devoted to human settlements and human health in 1976, just over \$8 million in 1976 to ecosystems, \$3.5 million each to oceans and to environment and development, and nearly \$3.5 million to Earthwatch. Other areas such as energy and natural disasters, received smaller amounts.

On preparations for 1977 Desertification Conference

In its capacity as the preparatory body for the United

Nations Conference on Desertification (UNCOD), the Governing Council also discussed substantive preparations for the Conference, due to be held in August 1977. The sum of \$2,023,500, was allocated from the Environment Fund towards preparations for the Conference during 1976 and 1977. At the thirty-first session of the General Assembly later in 1976, the Executive Director of UNEP was requested to assume the responsibility of Secretary-General of the Conference.

On institutional arrangements

- (a) The Governing Council advised the General Assembly through the Economic and Social Council (ECOSOC) that, in its view, the institutional arrangements for international environmental co-operation*, after about four years of operation appeared "adequate and sound" and should not be changed at that stage. It was also decided that the agenda for future annual sessions of the Governing Council of UNEP would consider phasing items so that some issues were dealt with at length only at alternate sessions.
- (b) *Regarding elements for restructuring*, the Council recommended to the General Assembly at its thirty-first session, through ECOSOC, that whatever decisions were taken on the restructuring of the economic and social sectors of the United Nations system, a number of environmentally-significant elements should be strengthened within the system and given institutional visibility. Eight conditions which the United Nations system should maintain were spelled out** within a clearly identified institutional arrangement.
- (c) *On Human Settlements*, participants of Habitat, the United Nations Conference on Human Settlements (June 1976) were invited to take note of recommendations made at Stockholm in 1972 on environmental approaches to the planning and management of rural and urban settlements at all levels.

B. Adoption by ECOSOC of the Governing Council's report at its fourth session***

The Governing Council report is submitted to the General Assembly through ECOSOC. At its 61st session in August 1976, ECOSOC expressed satisfaction with the report of the Governing Council's fourth session, and invited the General Assembly to approve recommendations made by the Governing Council, particularly those dealing with the Conference on Desertification (decision 73 of GC(IV), paras. 5-8),

- that the Executive Director should be appointed Secretary-General of UNCOD;
- that invitations to UNCOD should be extended to all States and interested groups, whether international,

*See The State of the Environment.

*General Assembly resolution 2997 (XXVII), in 1972 which established UNEP called for a review of the institutional arrangements for international environmental co-operation at its thirty-first session in 1976.

**See section C(ii).

***E/5876 (ECOSOC paper).

non-governmental or specialized, in accordance with established practice;

- that the draft provisional agenda for the Conference be approved with amendments.

The Economic and Social Council also referred the General Assembly's attention to the decision regarding preparations for the United Nations Water Conference (para. 3, decision 55 of GC(IV)), and to the Governing Council's conviction that the environment should be an essential part of international discussions on development.

Finally, the General Assembly's attention was drawn to the Governing Council's appeal to those governments which had not announced contributions to the Fund of UNEP to do so as generously as they could afford and, in cases where governments had announced a contribution, to honour their pledges promptly.

C. General Assembly resolutions:

The General Assembly considered the Governing Council's report in October 1976 and ECOSOC's comments on it. Among the important resolutions taken concerning UNEP were:

(i) the report of the Governing Council of UNEP

In approving this report, the General Assembly stated its conviction that sustained development was only possible if, at the same time, there was a clear commitment to preserve the environment and promote the rational use of natural resources for future generations. The General Assembly

- noted with approval the Executive Director's report on the status of the Fund of UNEP and urged governments to continue giving it financial support;
- endorsed ECOSOC's resolution concerning UNEP's active participation in preparing for the United Nations Water Conference;
- reaffirmed the Governing Council's belief that the environment should be a major consideration in international discussions on development;
- noted the references to the study of the problem of the material remnants of war, particularly mines, and their effect on the environment and requested the Governing Council to ensure that the report was completed, taking note of the views expressed on the matter;
- noted the Secretary-General's report on international conventions and protocols in the field of environment and repeated its concern* that these had not yet received the wide acceptance and application they deserve.

(ii) institutional arrangements for international environmental co-operation

The General Assembly endorsed the Governing Council's view that the institutional arrangements for international environmental co-operation were sound and adequate, and that in any decision on the restructuring of the economic and social sectors of the United Nations system cer-

tain environmentally-significant elements should be strengthened and given institutional visibility. Elements such as taking responsibility for environmental issues of a global nature; providing guidance and leadership in international environmental affairs; offering suitable forums and facilities for treaty-making in the field of environment at global and regional levels; and identifying through the "programmatic process"* emerging environmental problems and proposed solutions were noted. The General Assembly decided to maintain the present arrangements at this stage.

(iii) institutional arrangements for human settlements

General Assembly decisions on human settlements institutional arrangements hinged on such factors as follow-up on the Habitat Conference at Vancouver and that institutional arrangements for human settlements activities needed further defining.

Based on these considerations, the General Assembly deferred until its next session in 1977 a decision on the type of definitive inter-governmental body for human settlements and on the organizational link and location of the human settlements secretariat:

requested that action should be taken on the recommendations of the Habitat Conference regarding institutional arrangements after considering the report of the Secretary-General and the *Ad Hoc* Committee's and regional commissions' views;

decided that action will be taken on recommendations, at the latest, at its thirty-second session in 1977.

As a temporary arrangement, the General Assembly requested the Secretary-General to ensure, through appropriate channels, that human settlements activities were co-ordinated within the United Nations system and to report to the 1977 session of ECOSOC on progress made.

(iv) re-election of UNEP Executive Director

The General Assembly unanimously elected Mr. Mostafa K. Tolba to serve as Executive Director of UNEP for a further four years beginning 1 January 1977, following his nomination to the post by the Secretary-General.

D. Relations with other intergovernmental organs within UN

The year under review was marked by a number of significant activities which considerably improved co-ordination at intergovernmental level. Governments were clearly anxious to accelerate the process, as was evident in the deliberations of the following UN bodies:

(i) the Advisory Committee on Administrative and Budgetary Questions

This Committee is a subsidiary organ of the General Assembly consisting of 13 members appointed in their individual capacities**. The Committee visited Nairobi from 31 May to 5 June to consider UNEP activities, as requested

*See resolution 3436 (XXX) of 9 December 1975.

*See Introduction to Summary of Three Overviews.

**See also (ii) under this section.

by the General Assembly. The visit resulted in a report (A/31/227, September 1976) by the Committee on co-ordination in the field of environment.

(ii) the Committee for Programme and Co-ordination

The Committee advises and assists ECOSOC and the General Assembly in discharging its co-ordination functions and keeps under review the activities of the United Nations and its related agencies and programmes. Among the tasks assigned to the Committee for Programme and Co-ordination were:

- to examine and co-ordinate the programme objectives submitted by ECOSOC's subsidiary bodies (including UNEP), in the light of the system of medium-term planning and programme budgeting;
- to recommend an order of priorities among United Nations programmes, as defined in the medium-term plan. (For other terms of reference see A/10117). This is in accordance with General Assembly resolution 3392 (XXX) entitled "Review of the intergovernmental expert machinery dealing with the formulation, review and approval of programmes and budgets."

The medium-term plan constitutes the principal policy directive of the United Nations in which:

- the medium-term objectives to be attained in a four-year period are stated;
- strategy to be followed to that effect and the means of action to be used are described;
- an estimate of resources needed in over-all terms and by major programmes are given.

The introductory pages of the environment chapter of the medium-term plan* give a summary account of environment policy co-ordination mechanisms within the United Nations system, and an account of their operation in the area of human and environmental health. Much of the remainder of the chapter describes the environment programme under ten sub-programmes, the text being based upon the programme document presented to the Governing Council at its fourth session. The chapter ends with an account of the environmental activities of several United Nations regional commissions.

United Nations Board of Auditors

This Board made an interim audit for the fiscal period 1976-7 biennium period. It is appointed by the General Assembly. The report of the Board of Auditors on the audited accounts of the Fund of UNEP for the year 1975 was considered by the General Assembly at its 31st session in 1976.

E. Contacts with governments through the Executive Director

The Executive Director of UNEP held consultations in January with the Egyptian Government. He opened the plenipotentiary conference of Mediterranean states at

Barcelona, Spain in February, and paid an official visit to Pakistan from 16 to 18 March at that Government's invitation. At the invitation of the Government of India he visited that country in April, and during June he visited France, Libya and Zaire at the invitation of the respective Governments.

On 27 May the Executive Director was in Tokyo to address an International Symposium on Environment, and by 31 May he was in Canada to address the opening of the United Nations Habitat Conference at Vancouver. While in Canada he had consultations with the Canadian Government. He paid an official visit to Poland in July, and later to the USSR from 6 to 8 October, and to Hungary from 9 to 12 October where he also attended the World Conference on Development.

The Executive Director also met government representatives when he attended two meetings on Deserts in Geneva in January, and a senior consultants' meeting on the Desertification Conference in March, again in Geneva. He addressed the Executive Board of the United Nations Educational Scientific and Cultural Organization (UNESCO) in Paris in May and also addressed the fourth United Nations Trade and Development (UNCTAD) meeting in Nairobi. He made a statement at the sixty-first session of ECOSOC in Abidjan in July. Contacts with the British Government were made when he was in London to address Chelsea College in June. In August-September, during a working visit to Addis Ababa, he held discussions with the Organization for African Unity and the Economic Commission for Africa.

He was in New York for the opening of the United Nations General Assembly in September and returned in October for the debate on UNEP in the second Committee. In October he opened a UNEP seminar on industry in Paris. The Executive Director addressed the UNESCO Conference in Nairobi in November. He attended the opening in Malta of a regional centre to help combat oil spills in the Mediterranean in December, and on 13 December addressed the Earthscan Press Seminar on water held in London.

F. The Fund

The Governing Council authorized the Executive Director to allocate \$34 million for Fund programme activities in 1976.

A total of 84 new projects were approved during 1976 covering a variety of environmentally-related subjects and in collaboration with other United Nations agencies as well as governments. The total sum of pledged resources recorded for the period 1973-7 stood at over \$107 million from 69 countries. The Governments of Chile, Cyprus, Ireland, Turkey and the United Republic of Tanzania pledged for the first time in 1976. The year 1976 had the best annual payment record to date, with a smaller outstanding balance than in any previous year (see Chapter V, the Environment Fund).

Initially, Fund-supported activities emphasized research, pre-programming studies and similar steps to establish

*Medium Term Plan 1978-81, Vol. 1, A/31/6/Add 1, Ch. VIII, paras. 399-487.

an understanding of environmental problems. It has, however, become increasingly clear that what Governments now require is practical advice on aspects of environmental management; the pattern of Fund-supported activities reflected this concern in 1976.

G. The Secretariat

In addition to the reappointment of Mr. Mostafa K. Tolba, of Egypt, as UNEP Executive Director, there were three other changes and/or developments concerning the senior staff of UNEP. Among them:

- (a) Mr. R. Bruce Stedman, formerly Acting Deputy Executive Director, was designated as Deputy Executive Director from 1 January 1977.
- (b) Mr. David Munro, of Canada, was appointed Special Adviser to the Executive Director of UNEP, in January 1976. He also served as the Acting Administrator for the United Nations Habitat and Human Settlements Foundation during the year.
- (c) Mr. Jean Fauchon, of France, was appointed Director of the Division of Ecosystems and Natural Resources in November. He succeeded Mr. Michel Baumer, also of France.

Regional offices

UNEP strengthened some of its Regional Offices with the appointment of Regional Advisers for Africa, Asia and the Pacific, and West Asia.

Progress at Gigiri

Plans to build the permanent headquarters at Gigiri were extensively discussed during 1976. UNEP occupies temporary headquarters at Gigiri, to which it had moved from Nairobi city centre in December 1975.

When the United Nations Secretary-General, Mr. Waldheim, visited UNEP headquarters in May he thanked the Kenya Government for its co-operation and assistance to UNEP in setting up its headquarters at Gigiri.

H. Other important developments concerning UNEP

(i) Habitat and Human Settlements Foundation

The United Nations Habitat and Human Settlements Foundation was established by General Assembly resolution 3327 (XXIX) as of 1 January 1975. Its establishment was a direct result of recommendation 17 of the United Nations Conference on the Human Environment, Stockholm 1972, which *inter alia*, recommended that "Governments and the Secretary-General take immediate steps towards the establishment of an international fund or a financial institution whose primary operative objectives will be to assist in strengthening material programmes relating to human settlements. . . .".

In establishing the Foundation, the General Assembly in the resolution decided that the Governing Council of UNEP would also be the governing body of the Foundation and that the Executive Director of UNEP would be responsible for its administration. The primary source of funding for the Foundation, according to the General Assembly resolution, would be through voluntary contributions by Governments and private institutions. The UNEP Governing Council authorized a one-time grant of US \$4 million to provide for the initiation of the Foundation's operations.

The Foundation is the only financial institution in the U.N. system for human settlement purposes. It seeks to obtain its objectives through the provision of seed capital and the extension of the necessary technical assistance to permit an effective mobilization of domestic resources for housing and the environmental improvement of human settlements.



The UN Secretary-General, Mr. Kurt Waldheim, visited UNEP in 1976. He is seen at Gigiri with (left) the Executive Director of UNEP, Mr. Mostafa Tolba, and (right) the Deputy Executive Director of UNEP, Mr. R. Bruce Stedman.

The Foundation functions under the responsibility of the Executive Director of UNEP, and its staff is located in the temporary headquarters of UNEP.

(ii) The Scientific Committee on the Effects of Atomic Radiation

On 1 September 1976 the Secretariat responsibility for the United Nations Scientific Committee on the Effects of Atomic Radiation was organizationally transferred to the United Nations Environment Programme from the office of the Under-Secretary-General for Special Political Affairs. The Committee secretariat continues to be located in Vienna.

I. Relationships within the United Nations system

The Environment Co-ordination Board* was established by General Assembly resolution 2997 (XXVII) and reports annually to the Governing Council of UNEP. It is chaired by the Executive Director of UNEP and is composed of the Executive Heads of the specialized agencies, IAEA and other organizations of the UN system. It co-ordinates environmental activities in the United Nations system, through its focal points, its working groups and a joint programming process.

In 1976 the Board classified its function as follows:

"The Environment Co-ordination Board is both a means of enabling the United Nations Environment Programme to co-ordinate the environmental programmes of the United Nations system, and a means through which its members contribute to the formulation of UNEP programmes. Thus it promotes active, system-wide co-operation in drawing up and reviewing the environment programme adopted by the Governing Council of UNEP, secures the implementation of the programme and enables Board members to exchange experience so as to provide a sound basis for continuing co-operation within the framework of the relevant decisions of their governing bodies."

ECB focal points

The day to day working relations between UNEP and the rest of the UN system are co-ordinated by "focal points" in each agency, with a counterpart in UNEP. They—senior officials designated as such—act as the central channel of communication on environmental questions between the Secretariat in Nairobi and the agency concerned.

The focal points, which act as a preparatory committee for the sessions of the Environment Co-ordination Board, meet three times a year:

- (i) in January, mainly to review the Environment Programme documents;
- (ii) after each Governing Council, to review the outcome of the Council and to adopt the Board's plan of work for the coming year;
- (iii) in September, to prepare the Board meeting which is held in the following month in conjunction with the autumn session of the Administrative Committee on Co-ordination of the United Nations.

ECB working groups

Several working groups have been set up, for example one on Earthwatch which met in September. This group decided to set up sub-groups for the International Register for Potentially Toxic Chemicals, the International Referral System, and the Global Environmental Monitoring System. These permanent and *ad hoc* interagency working groups help to ensure continuing and detailed collaboration on selected topics of the programme.

Joint programming

The Environment Co-ordination Board adopted a definition of joint programming as the identification by means of an in-depth exchange of information and consultations at the time of programme formulation—of the areas and issues of mutual interest thereby providing a basis for a shared programme of work.

Bilateral joint programming exercises took place in 1976 as follows:

<i>Organization</i>	<i>Date</i>
World Health Organization	April
International Labour Organisation	July
UN Conference on Trade and Development	July
Economic Commission for Europe	July
World Meteorological Organization	September
Office of the UN Disaster Relief Co-ordinator	September
Food and Agriculture Organization	October
World Food Council	October
World Food Programme	October
UN Economic/Social Affairs department	October
Inter-governmental Maritime Consultative Organization	November

Following these exercises joint memoranda of understanding were signed with some of these organizations.

J. Relationships with non-governmental organizations

UNEP continued to develop working relationships with a wide range of nongovernmental organizations (NGOs) during 1976, as requested by the Governing Council. An NGO Profile Survey carried out by the NGO Environment Liaison Centre with UNEP support resulted in responses from more than 1,800 NGOs.

World Environment Day activities by NGOs

Many NGO media and action campaigns were carried out on the theme for World Environment Day, 1976: "Water—Vital Resource for Life". The World Environment Day project was evaluated by a team of experts, who recommended that UNEP should expand its activities with NGOs in future World Environment Day campaigns.

Among the campaigns carried out were: the Walk for Water Development organized by the Kenya Freedom from Hunger Council, in which 20,000 participated; the Vancouver Water Symposium and World Water Day Walk sponsored by NGOs at the Habitat Conference; the Gandhi Peace Foundation Water Awareness Programme in India; and "The Environment is Where You Live" campaign in Australia, in which community centres and churches were active. The Conservation Council of Ontario published materials on the dangers of cancer agents in polluted waters. In Czechoslovakia the International Union of Students issued an appeal to all students to show concern for water resources. The Union Mondiale des Pionniers de Stockholm, France, carried out a one-week programme of water-oriented activities, which were publicized on radio and television. NGOs participated in

*See Annex B2

the first National Seminar on Conservation and Environment, held during World Environment Week in Guatemala. In the Netherlands NGOs were instrumental in the creation of a national environment day committee.

NGOs at Habitat

In response to requests from NGOs, UNEP's NGO Liaison Office took an active part in the planning of NGO activities at Habitat: United Nations Conference on Human Settlements. The Human Settlements Working Group of the International Assembly of Non-Governmental Organizations Concerned with the Environment was given information and personnel support by UNEP for activities at the NGO Forum at the Habitat Conference. Acting on General Assembly resolution 31/144 ("Collaboration between the United Nations and non-governmental organizations with regard to world-wide intercommunal co-operation") UNEP and the United Nations Habitat and Human Settlements Foundation have carried out consultations with NGO experts on co-operative activities between the United Nations and NGOs as a follow-up to the Habitat Conference, and will hold an expert group meeting of NGOs at Nairobi in May 1977 to develop co-operative programmes on human settlements.

Among the NGOs expressing interest in co-operative activities are the International Union of Architects, the International Union of Local Authorities, the International Institute for Environment and Development, the United Towns Organizations and the League of Red Cross Societies.

UNEP has co-operated with NGOs in developing several UNEP Fund-supported activities, including "Environmental protection and assessment measures of some multi-lateral development financing agencies: a review of programmes and their implications" by the International Institute for Environment and Development; "Soil resources of the earth, their evaluation, utilization and preservation" by the International Federation of Institutes for Advanced Study; "International programme in environmental management education" by the Centre for Industrial Studies.

K. Relations with others

By December 1976, a total of 83 UNEP Press Releases were issued and distributed to the world press as well as to embassies, diplomatic missions, organizations and institutions. Information material was also published and distributed at regular intervals during the year. A new monthly newsletter *Uniterra* was launched in August, and several books were published jointly with individuals or organizations (see Annex F).

World Environment Day

"Water, Vital Resource for Life" was chosen as the 1976 theme of World Environment Day, June 5. More than 80 countries commemorated the day which marks the opening of the United Nations Conference on Human Environment on 5 June 1972 at Stockholm.

Some highlights of 1976 World Environment Day: The first-ever International Pahlavi Environment Prize

donated by the Government of Iran to the most outstanding contribution in the field of environment was awarded by the Secretary-General to UNEP's founding Executive Director, Mr. Maurice F. Strong. World Environment Day messages were given by the United Nations Secretary-General, the Executive Director of UNEP, and, on a national basis, by Heads of State or their representatives.

UNEP prepared and distributed specially printed Packs containing illustrated features in English, French and Spanish to 6,500 publications, television and radio stations all over the world as part of its World Environment Day material.

In countries like Australia, Ireland and Japan an Environment Week was established. Many governments took the opportunity to launch an environmental action to coincide with the Day, as in Colombia where a fish breeding programme was undertaken on 5 June, or in Monaco where a regional agreement for the protection of the Mediterranean coast was signed just before World Environment Day. In Kenya a national annual event, the Freedom from Hunger Walk, was combined with World Environment Day under the theme, "Walk for Water", and in Yugoslavia Youth Day on 25 May was linked to World Environment Day.

Requests for UNEP's World Environment Day material came from both government and non-government institutions, from individuals and the mass media to help conduct national or local environmental campaigns or to alert the public or simply to inform people about environmental issues.

The state of the environment

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"*. To assist the Governing Council in this task, the Executive Director prepares a report each year on the state of the environment. This is the fourth such report in the series. The previous documents 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). The present report is the first of the annual state of the environment reports which, instead of covering a broad range of environmental issues, focuses on a number of emerging and urgent topics of international importance — in this instance, on four topics: the ozone layer, environmental cancers, land loss and soil degradation, and firewood.

This arises out of a decision by the Governing Council at its fourth session that in future the annual state of the environment report should be selective in its treatment and that an analytical, comprehensive report on developments regarding each of the broad issues should be prepared every fifth year.

Man does not deliberately damage his own environment, any more than a rational person would purposely destroy his own house. But when man takes action to satisfy his needs—when he grows food, rears cattle, builds roads, establishes industries—his activities often involve side-effects which are environmentally harmful. Sometimes these environmental side-effects may make it difficult or even impossible for man to sustain his original activities.

Essentially, environmental management is a two-fold operation. First, we must seek to identify where environmental degradation and resource depletion are making it difficult to meet the basic human needs of food, shelter, health, clothing, education and work. Second, we must work towards the modification of human activities so as to eliminate any undesirable side-effects, and satisfy these basic needs on a sustainable basis.

The confrontation between the rising aspirations of a growing world population and the physical and ecological constraints of the biosphere has brought mankind face to face with the **outer limits** of what the planet can sustainably provide. The imperative need to satisfy basic human needs reflects **inner limits** which are no less inflexible. Rising

aspirations, outer and inner limits are the main components of the environmental issue, of which the international community, national Governments and the world population at large have become increasingly aware since the United Nations Conference on the Human Environment in Stockholm in June 1972.



"The rational management of a small planet" involves the control of atmospheric pollution in industrialized countries—

The tenth anniversary of Stockholm, 1982, will be for the United Nations Environment Programme a year of audit. UNEP will publish a major study analyzing the changes that have taken place in the human environment over the decade, and evaluate the first ten years in which mankind has consciously and co-operatively attempted the rational management of a small planet. A similar environmental overview will be repeated every five years, forming a set of quinquennial state of the environment reports which will complement and consolidate the series of essays on single topics contained in this and subsequent annual state of the environment reports.

The present report is the first annual state of the environment report prepared in line with Governing Council decision 47 (IV). The first topic presented in it deals with

the **ozone layer**, which lies in the high stratosphere 10-50 km above the surface of the earth and forms a vital protective barrier against harmful ultraviolet radiation from the sun. Certain human activities (such as supersonic air transport, use of some aerosol propellants, use of nitrogenous fertilizers and atmospheric nuclear explosions) which are designed to meet perceived human needs (such as rapid travel, household insecticide spraying, agriculture and defence) may adversely affect this ozone layer, and could therefore inhibit the satisfaction of other human requirements (such as the health of man, of his livestock and crops, or of the seas and oceans).

A likely effect of damage to the ozone layer would be an increase in skin cancer in man. This is only one of many forms of cancer, a disease which in many developed countries is today responsible for 17.2 per cent of all deaths¹. Well over half of all cancers are now thought to be of environmental origin, initiated by chemical compounds re-



—as well as providing basic human needs in developing countries.

leased by modern technologies or lifestyles. The second topic, **environmental cancers**, is therefore another example of the satisfaction of one perceived need at the expense of degrading the environment and damaging human health. This is only one example of a large class of environmental diseases.

The third topic of this year's report, **land loss and soil degradation**, deals with an even more fundamental threat to human well-being: damage to the agricultural base of food production. Present agricultural practices (such as the cultivation of steep slopes, slash-and-burn and deforestation) may damage the soil cover irreparably, and activities designed to meet other human needs (such as the construction of housing, roads and airports) may remove valuable land from agricultural production.

The fourth topic, **firewood**, illustrates how the extensive and indiscriminate use of trees for firewood is resulting in a rapid and alarming depletion of a key renewable resource, as well as bringing in its train erosion and soil damage.

These four essays do not pretend to be exhaustive. They are, rather, designed to illustrate that as always in environmental management, certain critical choices must be made: among various needs, among various ways of meeting them, among specific practices, and among the unlooked-for effects which may result from them.

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Ozone

Possible biological effects of ozone reduction in the atmosphere

Ozone — a form of oxygen — is of vital importance to man, although it makes up less than one millionth part of the earth's atmosphere. The largest concentrations of ozone occur in the stratosphere, the region of the atmosphere in the altitude range from about 10 to 50 km at high latitudes and 18 to 50 km at low latitudes. The dominant energy source for the stratosphere is the absorption of ultraviolet radiation by ozone and it is this absorption process which explains the average temperature rise from about 50°C below zero to 3°C below zero between the lower boundary (tropopause) and the upper boundary of the stratosphere (stratopause). An increase of temperature with altitude (a so-called temperature inversion) reduces the vertical mixing of air in the atmosphere considerably¹. This is the main reason why injected materials can remain a long time in the stratosphere.

Even at its highest concentration, around 30 km high², ozone is present at not more than one part per hundred thousand parts. Nevertheless, this small amount of ozone is of crucial importance for life on earth, since it protects organisms at ground level from the harmful ultraviolet component in sunlight. (It should be noted that ozone is also produced in photochemical smog³ at a relatively low level (around 1 km) in the troposphere. Added to the small concentrations of ozone which diffuse down from the ozone layer, smog-produced ozone can adversely affect human health and plant growth. This is a separate, but related, environmental problem.)

Without sunlight, life on earth would not exist. Yet too much sunlight can be injurious to living organisms. The spectrum of solar radiation is divided into three different parts: visible light (from 380 to 770 nm in wavelength: a nanometre (nm) is one billionth of a metre), longer wavelengths are known as the infrared and shorter wavelengths as the ultraviolet (UV). In the UV part there is not much total energy but the individual photons are much more energetic than those at longer wavelengths.

Ecologically, the most important part of the UV spectrum is the UV-B region⁴, from 280 to 320 nm, which

causes sunburn in man, and has other marked biological effects. The stratospheric ozone layer to a great extent protects life on earth from the damaging effects of UV-B; indeed, without this protective shield, the present forms of terrestrial life could not have developed. The ozone filters out UV radiation, beginning at 320 nm, becoming increasingly effective at shorter wavelengths, and completely preventing radiation below about 290 nm from reaching the ground⁵. Other mechanisms besides that of the ozone layer are involved in absorbing UV radiation in the stratosphere, which complicates analysis of the precise amount of harmful UV-B to reach ground level. The net result of these factors, however, is that, averaged over the year, more than 70 per cent of the total UV-B to reach the planetary surface falls on the equatorial regions between latitudes 30°N and 30°S⁶.

Under natural conditions the main ozone-destroying catalysts are found in the atmospheric hydrogen system (hydroxyl radical — OH) and in the atmospheric nitrogen system (nitric oxide — NO). The effect of these naturally occurring catalysts on the ozone layer is to maintain the stratospheric ozone budget at its current relatively steady global level. However, in spite of the natural protection against pollution which the troposphere and the tropopause afford it, there are a number of human activities which affect the ozone balance by adding substantial amounts of ozone-destroying catalysts to the stratosphere.

First, there is the production of compounds, such as the chlorofluoromethanes used as aerosol propellants and refrigerants, and a number of other synthetic chemicals such as carbon tetrachloride and methyl chloroform. These substances are chemically inert in the lower atmosphere, but in the stratosphere they are converted by ultraviolet radiation to form the ozone-destroying catalyst, free chlorine. These chemicals are already thought to have reduced the ozone layer by 1 per cent, and if releases continue at 1973 rates, they could cause as much as a 3 per cent reduction in ozone by the year 2000, and up to a 10 per cent reduction by 2050. Significant damage to the ozone layer would be expected to continue for 50 to 200 years after man stops the release of these synthetic compounds⁷.

Second, there is the production of ozone-destroying catalysts within the stratosphere when aircraft, civil and military, flying above the tropopause release nitrogen oxides in their exhaust gases. In 1970-71 it was thought possible that several hundred civil supersonic transport aircraft would eventually fly in the stratosphere, and that these would be sufficient to reduce the average global ozone cover by 10 per cent or more. The effective abandonment of civil supersonic projects has removed this immediate threat; there is little information on the frequency of stratospheric flights by military aircraft. The use of chlorine-containing gases in the planned United States space shuttle may also lead to a small (0.1 per cent) decrease in ozone⁸. A recent report by WMO⁹, prepared in collaboration with UNEP and ICSU*, concluded that "currently planned supersonic transport aircrafts due to their lower flight altitudes of 17 km and their limited num-

ber (30-50 projected) are not predicted to have an effect that would be significant or that could be distinguished from natural variations" but that "a large fleet of supersonic aircraft flying at greater altitudes is predicted to have a noticeable effect on the ozone layer".

Third, there are the risks related to nuclear explosions in the atmosphere. Such action would result in "punching a hole" in the tropopause, propelling nitrogen oxides (NO and NO₂) and ozone-attacking chlorine into the stratosphere. One of the environmental consequences of a global nuclear war has been predicted to be a reduction of the ozone layer by 20 to 70 per cent for 5 to 10 years¹⁰.

Fourth, there is the possible production of nitrogen oxides due to the use of nitrogen fertilizers on a sustained and intensive scale for raising agricultural production. To raise yields, nitrate fertilizer is often added to the soil, or leguminous and other plants are grown which "fix" nitrogen from the atmosphere. Eventually, soil nitrate is converted back to nitrogen or nitrous oxide (N₂O) by the bacteria in soils and water. Some projections suggest that the nitrous oxide produced as a result of agriculture could at least double within the next 50 years. If an appreciable fraction of this entered the stratosphere, the ozone layer could eventually be depleted by as much as 15 per cent¹¹. However, there are many uncertainties: other calculations lead to lower estimates¹. Also the burning of fuels (oil, gas, coal, wood and dung) adds substantial amounts of nitrogen compounds to the atmosphere. These enter into the nitrogen cycle and parts will eventually reach the stratosphere as nitrous oxide and cause ozone destruction. It is therefore important to monitor the concentrations of atmospheric NO₂ and to learn more about its production and destruction mechanisms.

The weight of scientific evidence at present suggests that large-scale civil or military flying in the stratosphere, increased use of inorganic nitrogenous fertilizers and the continued release of chlorofluoromethanes into the lower atmosphere may perturb stratospheric ozone levels sufficiently to require world-wide controls, and that a global nuclear war could in this respect alone have disastrous consequences. Moreover, it should be realized that none of these effects should be judged separately from the others, as the damage done to the ozone layer by each of the various mechanisms is probably additive. Until 1970, the study of ozone and atmospheric chemistry was a severely neglected field of science, and integrated, interdisciplinary research is urgently needed. With this in view UNEP, together with the Government of the United States of America, is to convene a special conference on ozone in Washington in March 1977.

If the ozone layer were to be permanently weakened in one of the above ways, and an increase of ultraviolet radiation did reach the earth's surface, the most serious long-term consequence might be undesirable global perturbations in the earth's climate. However, this report is primarily concerned with the effects of living organisms.

UV-B can kill micro-organisms outright, and in plants and animals it can destroy individual cells. The molecular structures of proteins and nucleic acids, which are the

*International Council of Scientific Union

building blocks of plant and animal tissue and together make up the greater part of its dry weight, are damaged by ultraviolet radiation so that they can no longer properly perform their biological functions. Proteins are most sensitive to UV radiation at 280 nm, and nucleic acid at 260 nm, but in each case radiation around these peak wavelengths produces similar, though lesser, damage¹². It will be recalled that at present the ozone layer completely prevents UV less than 290 nm in wavelength from reaching the ground, so that the continued functioning of this stratospheric protection is clearly vital to all life on earth.

Over a long period of time, organisms have evolved mechanisms to withstand the amounts of UV reaching the surface of the planet under normal conditions — that is, under the protection of the ozone layer. They use four principal means: protective covering and pigmentation, which screens out the ultraviolet radiation; behavioural adaptation to avoid the sunlight; photoreactivation or photo-protective mechanisms; and dark repair mechanisms. In these ways, nature may have adjusted to a fairly high degree of short-term variability in UV exposure (there are 10-20 per cent fluctuations in ground-level UV from one year to another), but any significant and sustained increase of UV could be expected to disturb the existing balance of life⁴.

When plants are subjected to increased UV-B radiation in the laboratory, some crop species such as peanut, wheat, milo, and fescue prove fairly resistant, while others such as lettuce, pea, tomato, cotton, and radish are sensitive. In general, seedlings are much more sensitive than vegetative structures like leaves¹³. Where the amount of UV-B radiation is increased to simulate the effects of a 35-50 per cent ozone reduction in the stratosphere, minor changes in leaf anatomy, disruption of photosynthesis, and decreases in growth rates are observed in about half of the wild and crop species studied. The long-term biological implications, especially genetic changes, may be far-reaching¹⁴.

Preliminary investigations with phytoplankton, the microscopic floating plants which are the basis of the food chain in marine ecosystems, show that UV-B radiation reduces photosynthesis. Experiments off the coast of Africa suggest that under increased UV-B radiation photosynthesis of plankton may be inhibited by as much as 60 per cent. UV radiation can penetrate through water. For example, 75 per cent of the UV radiation at 318.5 nm was transmitted to a depth of 1 metre in natural waters off the coast of Corsica, and 43 per cent at 321 nm off the coast of Brittany. Additional studies are required to determine the exact magnitude of UV effects of marine ecosystems¹⁵.

Increased levels of solar UV-B radiation may also modify freshwater ecosystems by destroying micro-organisms, and reduce the efficiency of natural water purification. The impact of this modification on man depends on the body of water under study, and the quality of water considered tolerable for human consumption¹⁶.

The effects of increased UV-B on animals other than man have received little attention, as it has generally been assumed that the radiation is absorbed by hair, feathers,

scales, shells, and normal skin pigments. Presumably these factors will continue to provide some degree of protection, but some animals may already be at their UV-B tolerance limit, and further increases may produce harmful effects in animals that at present show no damage¹⁷. Unlike humans, most animals will not expose themselves to full sunlight unless they have a way of preventing excessive amounts of light from reaching sensitive tissues. Most marine species hide during the day, in crevices in rocks, burrows, or in deep water, coming out by night to browse on seaweed. Most terrestrial wild animals are nocturnal in habit, or keep in the shade of a forest during the day¹⁸.

In man, solar UV-B can cause sunburn, ageing and weathering of the skin and various forms of skin cancer. The skin's peak sensitivity for tanning and sunburn occurs around the wavelength of 297 nm. The wavelength most responsible for suntan, however, when the sun is at an elevation of 60°, is 307.5 nm. This peak effectiveness would be shifted downward in wavelength by about 5 nm — much nearer the wavelength to which man is most sensitive — and the total impact more than doubled if the amount of ozone in the stratosphere were to be reduced by one half. For smaller changes, the likelihood of sunburn in man increases by about 2 per cent for each 1 per cent decrease in stratospheric ozone¹⁹.

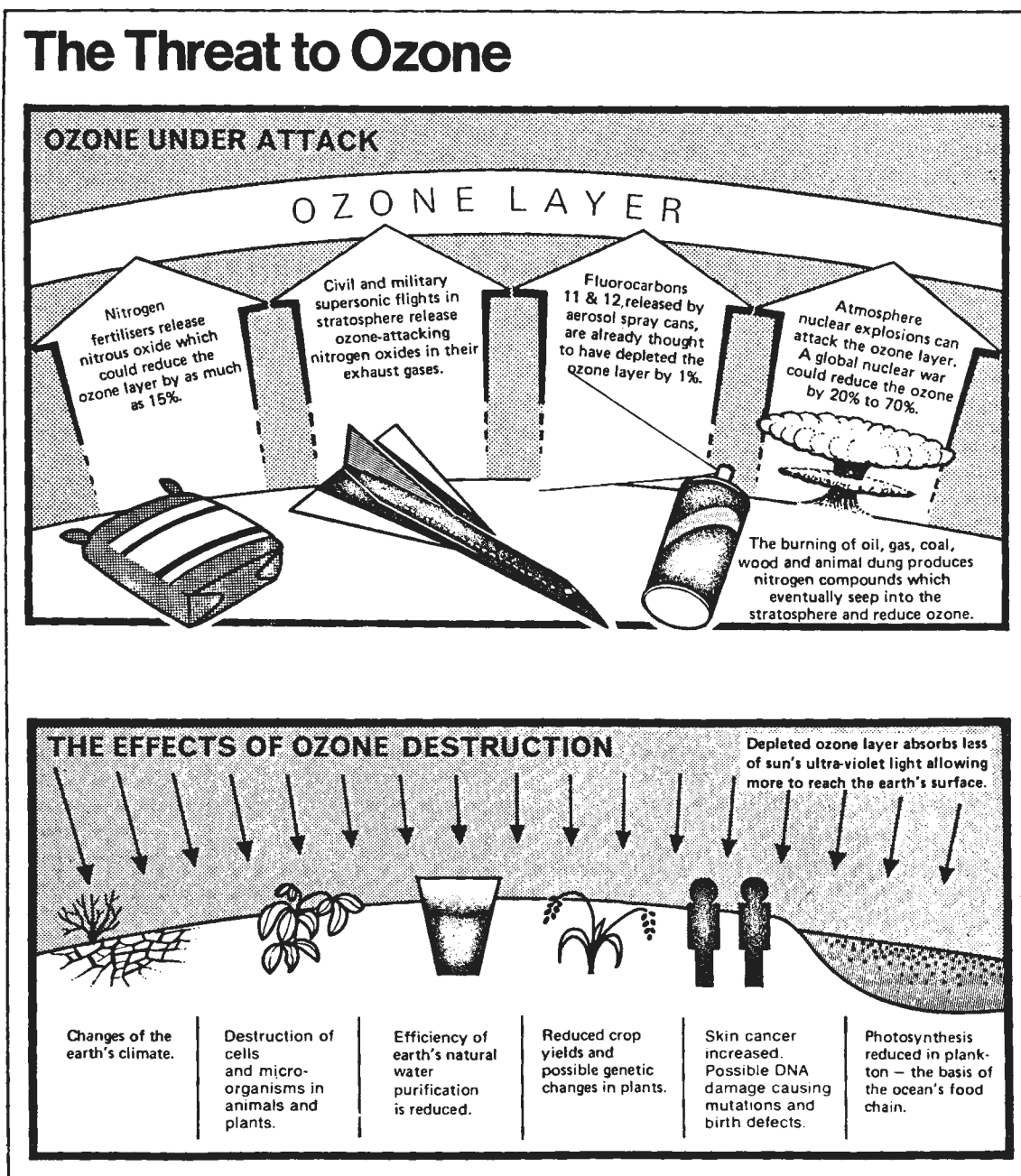
UV-B is also known to damage DNA — the genetic material of cells — and thus cause mutations. It is a reasonable hypothesis that skin cancer also involves the absorption of UV radiation by DNA; essentially the same radiation spectrum responsible for sunburn is responsible for skin cancer as well. Fatal forms of skin cancer are not confined to those areas of the body that are habitually exposed to direct sunlight. Skin cancer is more common in outdoor workers, and it is less common for heavily pigmented than for light skinned populations. The incidence of skin cancer among white-skinned Caucasians, particularly of malignant melanoma (a dark-coloured mole-like growth), arises with latitude and exposure to sun. In Queensland, Australia (10-30°S), the incidence of melanoma is three times, and in Texas, United States (30°N), twice that of Central Europe (50°N)²⁰, and in southern Norway (58°N) there are almost three times more melanomas than in northern Norway (70°N). Exposure to the sun, of course, is not only a question of latitude but also of climate, habit and clothing. Over a 20 year period (1955-74), the incidence of malignant melanoma in Norway has more than tripled for both sexes. Estimated outdoor exposure is far higher in melanoma patients, compared to a control group without skin cancer in New York²¹.

Nuclear weapons, aerosol sprays, supersonic transport, enhancement of food production to feed the people of the world are all examples of technological advances, but they would not normally be considered in the same context. It now appears, however, that they do have something else in common: they are all potential sources of catalytic agents that penetrate the earth's stratosphere and decompose the ozone that shields living things from the worst of the sun's ultraviolet radiation. The full extent of the environmental hazard associated with this phenomenon is still uncertain, despite several years of investigation. But

it is increasingly clear that a wide range of human activities have the capability of disrupting the delicate photochemical balance on which the earth's ozone buffer, and perhaps life itself, depends.

It would be premature to recommend specific regulations to abate the threat to the ozone layer: the complexities of

atmospheric physics and chemistry together with the intertwined interactions between air, water, soil, plants, animals and man make it exceedingly difficult today to express in quantitative terms the consequences of the human activities discussed above. But such uncertainties call for immediate interdisciplinary research in this important area of atmospheric-biospheric science.



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Cancer

60% to 90% of all cancers are linked to the environment

The relationship between cancer and the environment has been known since 1775, when Pott observed a correlation between scrotal skin cancer and heavy exposure to soot among chimney sweepers¹. Since then, many environmental pollutants have been shown to produce cancer in various parts of the body: aromatic amines cause bladder cancer; "blue" asbestos (crocidolite) causes mesothelioma of the lining of the lung and abdomen; uranium causes cancer of the lung. In recent years, a growing body of evidence from all over the world indicates that cancer, after heart disease the leading killer in industrialized societies, is overwhelmingly due to environmental factors. In 1958, it was suggested that 70-80 per cent of cancers were directly or indirectly related to the environment. Although the concept was challenged at the time, it is generally agreed today that 60 to 90 per cent of all cancer is in one way or another related to environmental factors, although it is clear that other factors are also involved.

All cancers are characterized by the unrestrained growth of cells. Cells naturally grow and multiply, but in a healthy body this growth is controlled by a complex series of mechanisms. Cancers occur when the control breaks down. In connective tissues (such as bone, cartilage, tendon, muscle) cancers are called sarcomas; in epithelial tissues (such as skin, bladder, lung, breast) they are called carci-

nomas; and in cells of the blood system they are named leukaemias. In most cases of cancer, unrestrained growth leads to the formation of tumours which spread into and often kill normal tissue. When not attended to, such a tumour (which is known as malignant) ordinarily leads to death, but there can be a long delay between its onset and the appearance of obvious symptoms.

Although cancer is widespread throughout the animal and plant kingdoms, it is best known and most important in human beings. The mortality due to cancer differs greatly in different places. In countries located in the tropical belt where communicable diseases are still rampant, the percentage of deaths due to cancer is much lower than in industrialized countries with temperate climates, where life expectancies extend to approximately 70 years. For example, in 1972 only 3.5 per cent of all deaths in the Philippines were due to cancer, while in Canada in the same year the figure was 20 per cent². For specific forms of cancer, the international variation is even more striking. Thus (for people of the same age-groups) cancer of the liver is almost a hundred times more frequent in Bulawayo, Rhodesia, than in Bombay, India, while citizens of Bombay have 50 times more mouth and pharynx cancers than people in rural Norway. Ibadan, Nigeria, has 12 times less stomach cancers than Miyagi, Japan, and over 40 times less cancer of the rectum than Saskatchewan, Canada³.

Cancer can be caused by a wide variety of factors, often acting in combination with one another, over periods of many years. It appears that certain cancers, for example, Burkitt's lymphoma, naso-pharyngeal carcinoma and perhaps cancer of the uterine cervix, are associated with herpesvirus infection. Other forms of cancer are caused by hereditary factors — for example, the rare tumour of the eye in children, retinoblastoma. But the overwhelming number of causative factors which have been isolated are in one way or another environmental: they relate to the air people breathe or the water they drink, to the environment in which they work or live, to their personal diet or way of life, to habits like smoking tobacco or drinking alcohol. In industrialized societies, such environmental agents have been proved to be responsible for 30 to 40 per cent of human cancers, and much research into the causes of cancer is now based on the hypothesis that all cancers are environmentally caused until the contrary is proved^{4,5}.

The significance of environmental factors in carcinogenesis has been defined mainly through epidemiological studies, i.e. studies of the origin, nature, pathology and prevention of diseases temporarily prevalent in a community or throughout a large area. A large number of environmental carcinogens have thus been recognized, as shown in Table 1⁶. The epidemiological approach has been very useful, too, in assessing the effects of a combination of environmental stimuli, e.g. cigarette smoking and living in areas polluted by industrial fumes.

Our most comprehensive understanding of environmental cancer is for the relationship between cigarette smoking and lung cancer. From our study of occupational exposure, we have learnt a great deal about the nature of chemical carcinogenesis. This is partly because carcinogens are likely to be at their highest concentrations in factories,

TABLE 1
Summary of high-risk groups indicating nature of exposure,
potential risk, and organs involved*

Chemical	Exposure patterns**	Relative risk	Site of neoplasm
Aflatoxin	General population (high in Africa): 0.12-0.35 µg/kg in food + 0.05-0.17 µg/litre in beer in Kenya	Low	Liver
Arsenic	Ind — Vineyards, miners, copper smelters (8,047) Med — Fowlers solution Env — Water (Total number of persons exposed unknown)	High	Respiratory tract
Asbestos	Ind — Miners, insulation and brake-lining workers (total number of persons exposed unknown)	Very high	Lung
Auramine	Ind — Exposure during manufacture (total number of workers exposed unknown)	High	Bladder
Benzene	Ind — Shoemaking, solvents (total number of workers exposed unknown, but in the thousands)	Moderate	Leukaemia
Diethylstilbestrol (DES)	Med — In one study 49 of 66 cases developing vaginal cancers had been exposed to DES in utero	Unknown	Vagina
Hematite	Ind — Mining of hematite, underground workers (more than 5,000 studies)	2-10 times increase in miners compared with non-miners or surface workers	Lung
2-Naphthylamine	Ind — Manufacture and use as antioxidant in rubber (total number of exposed workers unknown)	Very high	Bladder
Nickel	Ind — Refining, mainly in workers exposed prior to 1925 Env — Air, food (very small)	5-10 100-900 times expected figures	Lung, Nasal cavity
Soot and tars	Ind — Mainly to tars (thousands of workers exposed)	High	Skin (scrotum)
Vinylchloride monomer	Ind — Cleaning of polymerization reactors (exposures of 500-2,000 ppm 13 cases: >20,000 workers exposed)	Very high	Liver (blood vessels)

* Shortened from: J. Higginson, "Cancer etiology and prevention", in *Persons at High Risk of Cancer — an Approach to Cancer Etiology and Control*, J.F. Fraumeni, ed., (New York, Academic Press, 1975), pp. 385-98.

**Ind = occupational; Env = environmental; Med = drug.

but has more to do with the existence of records of employment which have sometimes survived the long latent period — up to 40 years or more in some cases — between exposure to the carcinogen and appearance of the cancer. The causation of many occupational cancers is now known: lung cancer among asbestos insulation workers, respiratory cancer in workers exposed to arsenic in smelters and vineyards, liver cancer among workers with vinyl chloride, leukaemia among shoemakers and others exposed to benzene solvents, nasal cancer among nickel workers, are only some of the examples⁷.

The boundary between strict occupational exposure to carcinogens, and a more general contamination of the environment outside, is a narrow one. A rare form of cancer of the lining of the lungs or the abdomen, mesothelioma^{8,9} is now known to occur mainly among people who had worked with "blue" asbestos (crocidolite) up to 40 years previously. But some cases are known among the families of asbestos workers, who presumably brought the toxic dust home on their clothes, while other cases again occur with people who once lived a kilometre or two away from a "blue" asbestos works but never worked there.

No food additives are known to be related directly or indirectly to carcinogenic effects but, in canned meats, nitrates may be reduced to nitrites and then react with amino groups to form N-nitroso compounds, which are among the most potent animal carcinogens known. Millions of people in Africa and elsewhere are exposed to aflatoxins, caused by fungal contamination of stored food, which can cause liver cancer. In general, cancers of the digestive system — mouth, gullet, stomach, rectum, etc. — seem to be related less to specific food additives than to general diet. Certainly, in the United States the incidence of stomach cancer varies mainly by ethnic groups, and is presumably related to their different eating habits.

Some drugs normally used under medical supervision are now known to cause cancer. A drug formerly given to pregnant women to prevent abortion, diethylstilbestrol is associated with vaginal cancer in their young daughters by transplacental carcinogenesis, for example, and the drug chlornaphthazine given to treat leukaemia appears to cause bladder cancer^{6,10}. Medical X-rays, like radiation from nuclear power plants, can significantly increase the incidence of cancer, though their effects can be minimized by proper management of the radiation. And, as was discussed in the previous chapter, the ultraviolet radiation from the sun causes skin cancer.

Heavy tobacco-smoking causes lung cancer and excessive alcohol-drinking causes oesophageal and liver cancer. It is now well established that (for United States males) a person who smokes 10-19 cigarettes per day is more than eight times more likely to die of lung cancer, and someone who smokes over 40 cigarettes per day is nearly 20 times more likely to die of cancer than is a non-smoker¹¹.

With smoking, the risk solely affects the individual concerned, and it may be argued that since he alone chooses to smoke we are not dealing with a strictly environmental cancer. But, as in the case of occupation-related carcino-

gens, the distinction is a fine one. Research has already demonstrated that non-smoking children in families which include a heavy smoker are substantially more likely to contract coughs, colds and other respiratory infections than children in non-smoking families. It is possible in practice, by applying modern statistical epidemiological techniques to distinguish between the effects of cigarette smoking and other carcinogens in polluted air.

At a high dose level, a carcinogen may be enough to cause cancer by itself. But after a lower dose, which by itself would not lead to cancer, other carcinogens and other non-carcinogenic factors may act during the latent period to potentiate the initial exposure. An experimental animal treated with a low dose of carcinogenic polycyclic aromatic hydrocarbon has a greater chance of developing a liver tumour if the liver is at the same time subjected to a mild injury. These hydrocarbons are, incidentally, found in charcoal-grilled steaks. Uranium miners and coke-oven operators, who have a greater chance of dying from lung cancer than the bulk of the population, substantially increase their risk if they are cigarette smokers as well.

In the last quarter of a century, there has been an exponential increase in the numbers and quantities of organic chemicals manufactured and used in industrialized countries. Some half million chemicals are currently in use, and another 10,000 or so new ones are produced each year in quantities of over 500 kilograms; a large proportion of these eventually enter the human environment. Very many are undoubtedly carcinogenic, but the cancers they produce may take years to manifest themselves in man, and it may be far longer before a causal relationship can be established between carcinogen and cancer. This makes it essential for such chemicals to undergo careful laboratory screening for carcinogenesis before they are widely used and distributed.

Once released to the environment, a cancer-producing chemical becomes part of a total carcinogenic milieu, acting together with many other carcinogens, potentiators and other factors to build up the rapidly growing spectrum of cancer which now affects developed countries. As the less developed countries become industrialized and the life expectancy of their citizen increases through control of infectious and parasitic diseases, the problem of cancer control is bound to become more and more significant on a global level.

An entirely carcinogen-free environment would be an impossibility, if only because there is no practical way of screening all human beings from solar ultraviolet and background ionizing radiations, but there is an urgent need to recognize the carcinogenic (and other) hazards of environmental contaminants and weigh them critically against the benefits they confer. Since the direct and indirect costs of cancer in the United States alone are estimated at \$15,000 million annually¹², there are clear economic, as well as other incentives to effect a drastic reduction in environmental carcinogens.

The activities of the World Health Organization (WHO) and the International Labour Organisation (ILO) in respect to occupational cancer are of course central in this field.

Moreover, the roles of the International Agency for Research in Cancer (IARC) in preparing a register of carcinogenic chemicals (data on about 300 compounds have already been assessed and published) and of the International Register of Potentially Toxic Chemicals (IRPTC), established by UNEP with WHO are clearly important. Since environmental contaminants do not recognize political boundaries, further international, regional and national action is necessary to monitor the occurrence of carcinogenic agents in the environment and undertake epidemiological studies of their effects on exposed groups.

Action to combat the growing scourge of environmental cancer must be taken at every level: in the hospital and clinic, in the workplace by public health authorities, on the local, national, regional and international scale. Nevertheless, Government-sponsored campaigns against cigarette smoking and excessive alcohol consumption, the control of chemical pollution by strict industrial and environmental regulations, and other community action can never be entirely successful. To prevent many cancers, some degree of personal involvement is not only possible but essential. The evidence suggests that in the developed world a man who lives outside urban areas, does not smoke, eats and drinks with moderation, and reduces his exposure to sunlight may reduce his risk of cancer by at least 30 to 40 per cent; the figure for women is somewhat less^{4,13}. The development of such a disciplined personal cancer plan represents the individual's responsibility. The younger the age at which such disciplines are practised the more they have to offer. So what a man does not do for himself because of age or lack of will power, he could at least ensure that his children have the opportunity to do.

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Soil-Loss

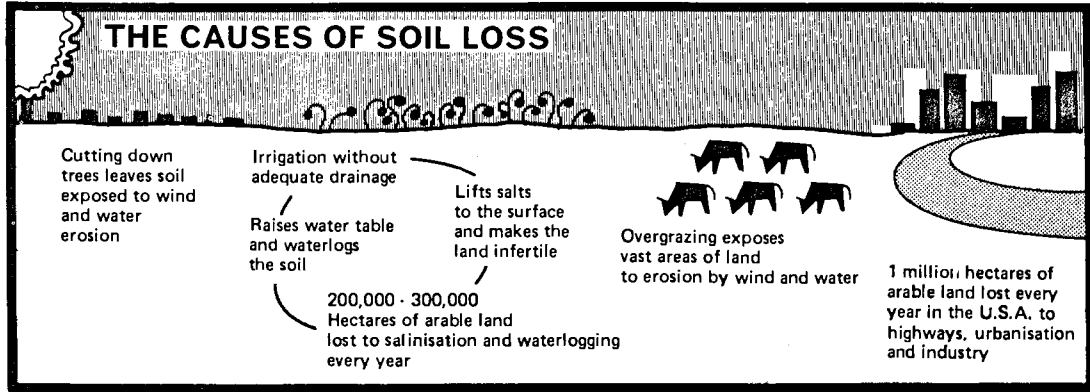
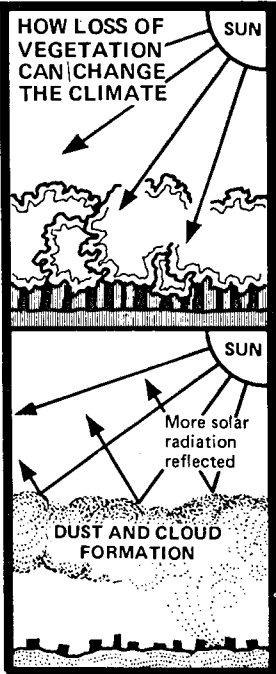
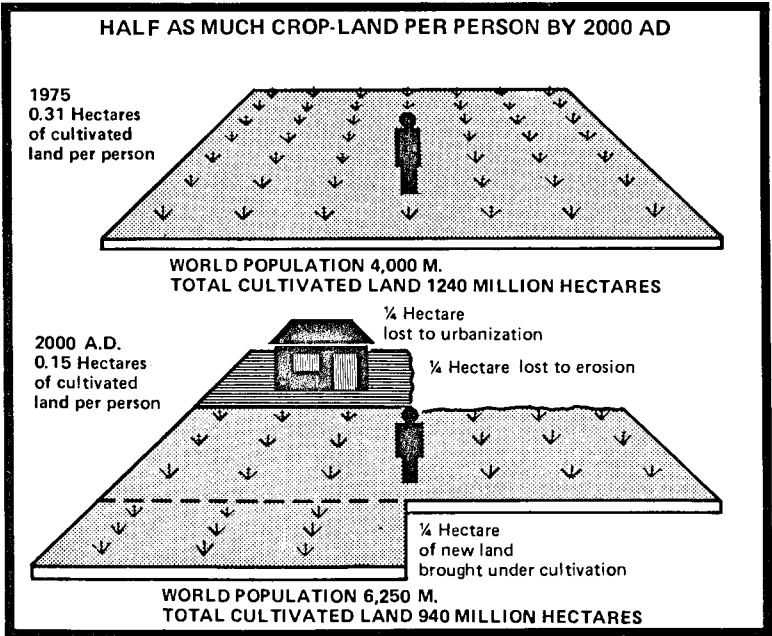
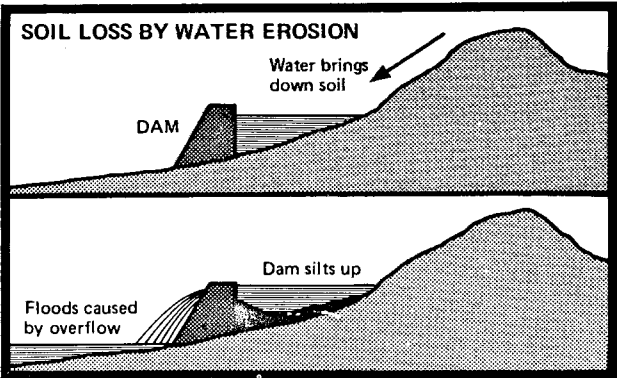
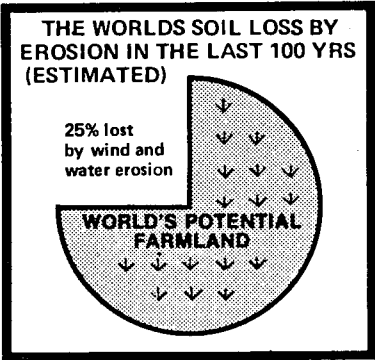
The area of cultivated land per head may be halved by the year 2000

Man depends for his food on the productivity of terrestrial and aquatic ecosystems, which he exploits through farming, ranching and fisheries. The productivity of agroecosystems — farmland — overwhelmingly depends on the capacity of the soil to respond to management. Soil provides a medium for a wide variety of biological and biogeochemical processes, and its reactions are basic to the functioning of the agroecosystem, since it provides plants with the essential requirements for growth. The formation and development of soil was a process spread over millennia. Its destruction or degradation, under excessive human pressure or misguided human activity, can occur over a few decades or even years, and is often irreversible.

In recent decades, man's management of agroecosystems has been steadily intensified, through irrigation and drainage, heavy inputs of energy and chemicals, and improved crop varieties increasingly grown as monocultures. Although bringing some general recent growth in agricultural production, this has made agroecosystems more and more artificial and often unstable, with the growing risk of such sudden failures as major pest outbreaks. Various forms of agricultural rotation—grass to crop to fallow, for instance—have become less and less used to remedy the "soil fatigue" which uninterrupted growth of one crop often brings. The organic humus content of the soil has declined as a result. For example, some soils in the United Kingdom are now suffering from dangerously low levels of organic matter, and cannot be expected to sustain present farming systems¹. At the same time, urbanization and the explosive growth of populations have led to the development of two distinct types of human settlement: urban and rural, with the rural settlements providing the food for the industrialized urban settlements. The closed cycle of the traditional agroecosystem has become open-ended. The near-natural recycling of materials that characterizes subsistence farming has been broken; nutrients and organic materials drain away into the urban sewerages and are no longer returned to farm soil, which instead receives a heavy input of industrial chemicals.

Throughout human history, there have been two aspects to agricultural development: the extension of farming to virgin soil, and the intensification of agriculture on land which is already farmed. On the one hand, low-productive land, such as deserts, solonchak, swamps and fenlands, has frequently become highly productive through heavy and costly ameliorations. A further major expansion of food-producing land is the object of large-scale programmes all over the world: the present 1,500 million hectares of crop producing land represent about one half of the 3,200 million hectares of land considered to be potentially suitable for agriculture², although the virgin soil left for potential expansion of agriculture is more difficult and much more costly to reclaim and to make productive, as the best soil has been already utilized throughout the world. On the other hand, the productivity per unit area has been increased through more intensive management.

Losing Ground



Pressure to expand the area under farming has resulted in more and more utilization of marginal land. Often, the appropriate technology for farming this land on a sustained basis does not exist; where such technology is available, it has frequently been disregarded for social or economic reasons, or political expediency. Overgrazing and overcultivation on steep hillsides everywhere has led to serious erosion; increasing pressure of slash-and-burn agriculture and forest industry is destroying tropical forests in South-East Asia, Central Africa and Latin America, leading to serious soil erosion; deforestation in the Himalayas is contributing to the increase in frequency and severity of flooding in India, Pakistan and Bangladesh; and overgrazing and deforestation is contributing to the southward march of the Sahara in the Sudano-Sahelian zone of Africa.

Unfortunately, at the same time as these trends are becoming apparent, the food-producing system is steadily losing vast areas of productive land. It has been estimated that, against the 1,500 million hectares of land currently used for crop production, nearly 2,000 million hectares of land have been lost in historical times. If present trends continue, it seems that all the programmes for adding more land to the food-producing system may not compensate for the areas lost as a result of soil degradation, and through competing land uses. Indeed, as Table 2 shows, some calculations suggest that the final quarter of this century will see a net loss of cultivable land. If this proves to be the case, when allowance is made for projected population growth, it is clear that this process will halve the area of farmland per person, which cannot be compensated by the growth of productivity per unit area through more intensive management during the same period.

at least 6 million acres (2 and one half million hectares) unsuitable for cultivation with the then available technology were ploughed between 1880 and 1920; in 1933 and 1934, following a severe drought, vast dust storms blew away from 5 to 30 cm of topsoil in what became known as the dust bowl⁵. Techniques such as terracing, contour ploughing, strip cropping and shelter belts, clean fallowing and several other anti-erosion systems have largely prevented a recurrence of such sudden disastrous losses of soil, but less dramatic soil erosion occurs today on every continent. In El Salvador, 77 per cent of the land area is suffering from accelerated erosion, and the silt load of the Citarum river in Java, whose basin is badly eroding through excessive cultivation, has increased sevenfold in three years⁶. In the eastern hills of Nepal, 38 per cent of the land area consists of fields which have had to be abandoned because the topsoil has washed away, while downstream in the plains of the Nepalese Terai, the same topsoil causes the river beds to rise by 15-30 cm a year. A measure of the rapidity of soil erosion is often given by the speed at which new irrigation and power generation reservoirs fill with silt. The Achicaya dam in Colombia lost almost one quarter of its storage capacity through siltation within 21 months of opening in 1955, and was nearly three quarters full of silt within a decade⁷. Pakistan's Tarbela dam, completed in 1975 at a cost of over \$1.2 billion, is expected to have a life of no more than 50 years because of silt washed down from the deforested and eroded Himalayas⁶.

Overgrazing can also create serious problems of soil loss and degradation. For example, in the Sudanese province of Kordofan on the Saharan fringe, the domestic livestock

TABLE 2
Projection for the period 1975-2000 regarding soil loss and reclamation

1975	Population.....	4,000 million ⁽³⁾
	Cultivated land.....	1,240 million hectares ⁽⁴⁾
	Cultivated land per person.....	0.31 hectares
1975-2000	Loss to urbanization.....	300 million hectares
	Loss to soil degradation (mostly erosion).....	300 million hectares
	Potential land added to arable base.....	300 million hectares
2000	Population.....	6,253 million*
	Cultivated land.....	940 million hectares
	Cultivated land per person.....	0.15 hectares

*ECOSOC/CN.9/324 (1977)

The present rates of soil loss through erosion may be as high as 2,500 million metric tons per year—over half a ton of soil for every man, woman and child on the planet. Mankind simply cannot afford such a loss of the very basis of agriculture.

Soil erosion is one of the most pressing and difficult problems facing the world community, yet its characteristics have been known for centuries. North Africa, for example, which was once the fertile granary of the Roman Empire, is currently a desert or semi-desert which has to import much of its food. In the great plains of the United States

population quadrupled between 1957 and 1966; the numbers have increased further since then⁸. Such overgrazing breaks down the dynamic equilibrium which once existed between livestock and natural rangeland, creating semi-desert vegetation dominated by ephemeral annuals. Eventually, the destruction of plant cover creates patches of bare soil, causing serious wind erosion. Similar problems due to overgrazing have been observed in other parts of Africa, in Latin America, around the Mediterranean basin, in the Indian subcontinent, in Australia and elsewhere. For sustained long-term productivity of grassland and rangeland, the carrying capacity of land must be care-

fully evaluated and not exceeded. The world plan of action to combat desertification, to be considered at the United Nations Conference on Desertification in August 1977, offers a comprehensive long-term global campaign to conserve the soils of arid lands.

A decline in soil fertility or even a total loss of land to agriculture, due to increase in salinity or alkalinity, is a common problem in many parts of the world. Without adequate drainage, excessive or unwise irrigation can lift salts to the soil surface, and even in the absence of sub-surface salts, waterlogging may reduce fertility. A study of major modern irrigation schemes in the Punjab shows that seepage from unlined canals has, in the first 10 years of operation, raised the water table 7 to 9 metres above previous levels. In Pakistan in the early 1960s, 22 per cent of all irrigated land was seriously damaged by waterlogging or salinity⁵, while in India in 1972 the figure was 15 per cent⁶. Some experts claim that the fertility of between 30 and 80 per cent of the world's irrigated land is currently being affected to a greater or lesser extent by salinization⁶. Among other major areas affected by salinization are the Helmut valley in Afghanistan, the Imperial valley and Colorado basin in the United States, the Mexicali valley in Northern Mexico, and the Euphrates and Tigris basins in Syria and Iraq.

On a global scale 200,000-300,000 hectares of irrigated land, an area the size of Luxembourg, is being lost by salinization and waterlogging every year. There are other ways, too, in which soil structure, fertility and productivity may be damaged. Over-use of pesticides and inorganic and other fertilizers, for example, can damage the natural microflora and microfauna of the soil. Excessive or inappropriate cultivation can also reduce the soil's agricultural potential. In the Tunisian Sahel tractor-drawn ploughs and disc harrows are breaking up the surface soil and thereby causing wind erosion far more than the animal-drawn ploughs they have replaced, while in parts of the United Kingdom drainage and thus crop yields have been reduced by compaction and loss of soil structure caused by the use of heavy machinery in unsuitable weather⁷. Of course, such processes as irrigation, machine cultivation, and the use of synthetic pesticides and fertilizers have played—and will continue to play—a key role in raising agricultural productivity. But in many areas of the globe insufficient care is taken to ensure that a rise in short-term productivity is not obtained at the price of temporary or permanent damage to the soil in which all agriculture ultimately depends.

Another important problem is the loss of productive agricultural land to competing uses. In the United States, about one million hectares of arable cropland are annually lost to highways, urbanization, and other non-farming uses, although this loss is partially offset by the addition each year (primarily through irrigation and drainage) of half a million hectares of newly developed cropland⁸. Worldwide, large cities are growing in area at approximately twice the rate at which they grow in population, and since they nearly all lie on fertile plains, this causes a serious loss of arable land⁹.

There is a related aspect of this problem: the influence of soil on climate. Soil bacteria play a key role in regulating atmospheric gases, and via them in most biogeochemical cycles, such as nitrogen, carbon or phosphorus. Dust particles of mineral and plant origin, which mainly come from the soil, are the basis of cloud formation and rainfall, and also affect the planetary temperature via influencing the proportion of solar radiation which is reflected back into space. Changes in soil cover may therefore influence planetary climate, just as the climate in its turn may influence the ease with which ecological mismanagement destroys the soil.

If adequate food for all of the world's expanding population is to be produced, the present rates of loss or degradation of agricultural land cannot be continued. Overgrazing, excessive cultivation, unwise irrigation, urbanization: solutions to the many and complex problems of soil deterioration and loss, and the permanent damage to the agricultural base of food production which this process entails, will vary from one continent, country, region, and locality to another. But while the sustainable management of any agroecosystem must be a matter of sound husbandry based on adequate scientific knowledge related to the particular local environment, a wider global perspective is necessary. UNESCO and FAO are already working towards this end; the World Water Conference to be held in Mar del Plata, Argentina, in March 1977 will draw attention to the key role of water supply, and the United Nations Conference on Desertification will focus on the various aspects of soil degradation in arid lands.

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Firewood The poor man's energy crisis

Many developing countries depend upon wood as their major source of fuel. In rural areas of the third world where wood is readily available, nearly 95 per cent of households use it as a primary source of energy. In 1974, according to statistics supplied by Governments to FAO, over 45 per cent of the total world round timber production was used as firewood or as charcoal¹ (see Table 3). Since the greater part of firewood production and usage takes place outside commercial channels and therefore

goes largely unrecorded, as much as substantially over half the world's wood crop could be burned as fuel. In developing regions, the proportion is much higher; according to FAO statistics, 93 per cent of wood cut in Africa south of the Sahara is used as fuel, and 86 per cent is so used over all the developing world².

In the world as a whole, wood is considered the fourth most important source of energy, after oil, coal and natural gas. These fossil fuels account for 90 per cent of the world's energy use but in 1971 wood provided only 6 per cent of the estimated total world energy consumption. In developing countries as a whole, wood accounts for 28 per cent of energy use, and in Africa south of the Sahara the figure is 75 per cent. Again, since most wood does not pass through the market system and is therefore not recorded, these figures are certainly underestimates. For the world as a whole 50 per cent of the wood consumed as fuel is used for cooking, and 30 per cent for domestic heating; the remaining 20 per cent is used for other household purposes, for processing agricultural products, and for industry. For the greater part of mankind, wood is the energy source which satisfies the basic needs of cooking and warmth³.

The magnitude of firewood consumption in the world, especially in the developing countries, as well as its significance in the everyday life of well over two billion people, was not realized until recently. The energy crisis which started in 1973, together with the increasing attention now being given to rural economies in general, and rural energy

requirements in particular, have attracted new interest to the problems of firewood.

Most firewood is for family use. The collection and transport of wood in rural areas is mainly by human and animal labour, so it is normally gathered from areas within walking distance of the consumer, a distance which in hard-pressed firewood areas such as the Indian subcontinent and the Sudano-Sahelian region may be as much as 50 kilometres. Even though firewood for the market moves over considerably greater distances, supply zones tend to be limited. Wood is an inefficient fuel compared with other energy sources, being relatively heavy compared to its output of heat and while a barrel of oil is worth transporting round the world, a load of firewood rarely travels more than a few hundred kilometres.

Firewood, then, comes overwhelmingly from local sources, and this puts growing pressure on the trees, bushes and shrubs near to centres of population. Long before the demand for fuelwood leads to complete destruction of the tree cover, it can have a markedly degrading environmental effect. Excessive pruning of the branches may reduce a tree's capacity for growth; removal of the more easily-felled younger trees may reduce the regenerative ability of the forest; excessive opening of the canopy through the removal of too many trees can render the forest susceptible to damage from wind and sun; the removal of all residues, even to the point in some areas of sweeping up the leaves, removes the nutrients that should return to the soil to maintain its fertility; removal of rocks,

TABLE 3
Estimated fuelwood and charcoal consumption, 1971

Region	Population (millions)	Woodfuel Consumption		
		Total million m ³	m ³ /cap	as a percentage of total round-wood consumption
World	3,683	1,381	0.37	52
Developed* economies	1,125	161	0.14	13
Developing economies	2,558	1,220	0.48	86
Southeast Asia and Oceania	306	278	0.91	88
South Asia	711	267	0.38	95
China and rest of Asia	839	148	0.18	75
Near East, North Africa	194	68	0.35	88
West and Central Africa	119	110	0.92	93
East and South Africa	103	117	1.14	93
Central America and Caribbean	92	33	0.36	75
South America	194	199	1.03	83

*Australia, Canada, Europe, Israel, Japan, South Africa, USA, USSR.
Sources: IBRD Atlas 1973; FAO Yearbook of forest production 1973.

stumps, bushes and shrubs can destroy much of what remains of the soil's protective cover and binding structure. And, eventually, the whole forest may be felled and disappear.

The uncontrolled and indiscriminate collection of firewood for cooking and heating, therefore, can have the most serious implications. Until the 1940s, forests had completely disappeared from most of China, because the trees had been cut down for fuel; in recent years, though, this trend has been reversed and vast areas have been successfully reafforested. In much of India, though, the forests are still rapidly declining⁴. With the growth of human populations, the forests are being cut down faster than they can grow, partly to make room for new farmlands, and partly for use as fuel. As a consequence, the upland areas — the watersheds for the great rivers which flow through the plains — are subjected to destructive erosion, while the resulting sediments cause rapid filling of reservoirs and destructive floods downstream severely reduce the cover of cultivable soil and the food which can be produced from it.

In semi-arid regions the ecological consequences of firewood consumption contribute to the process of desertification. Firewood is a scarce and expensive item throughout sub-Saharan Africa, all the way from Senegal to Ethiopia. A manual labourer in Niamey in Niger must now spend nearly one quarter of his income on fuel. But the price is higher than even he realizes. The caravans that bring this precious resource into the towns are contributing to the creation of desert-like conditions in a wide band along the desert's edge. Virtually all the trees within 70 kilometres of Ouagadougou in Upper Volta have been consumed as fuel by the city's inhabitants, and the circle of land stripped bare for firewood is continually expanding⁵.

Another negative environmental impact of the firewood shortage in India and some other countries is the burning of dung for fuel (see Table 4). Not only does this deprive the land of essential nutrients which should be returned to the soil, but it causes severe air pollution which can be grossly harmful to health. The burning of firewood and charcoal adds sizeable amounts of smoke and carbon

TABLE 4
Energy uses in rural India

Source of energy	Energy used (kcal)					
	Agriculture	Domestic activities	Lighting	Pottery brickmaking metalwork	Transportation and other uses	Total
Human labour	0.59×10^{14}	0.39×10^{14}		0.01×10^{14}	0.09×10^{14}	1.08×10^{14}
Bullock work	1.35×10^{14}				0.26×10^{14}	1.61×10^{14}
Firewood and charcoal						1.60×10^{14}
Cattle dung		6.78×10^{14}		0.75×10^{14}		1.86×10^{14}
Crop residues						1.07×10^{14}
Total from local sources	1.94×10^{14}	7.17×10^{14}		0.76×10^{14}	0.35×10^{14}	10.22×10^{14}
Petroleum and natural gas						
fertilizer	0.35×10^{14}					0.35×10^{14}
fuel	0.08×10^{14}		0.42×10^{14}			0.50×10^{14}
Soft coke		0.14×10^{14}				0.14×10^{14}
Electricity						
Hydro*	0.03×10^{14}		0.01×10^{14}			0.04×10^{14}
Thermal**	0.12×10^{14}		0.05×10^{14}			0.17×10^{14}
Total from commercial sources	0.58×10^{14}	0.14×10^{14}	0.48×10^{14}			1.20×10^{14}
Total, local and commercial	2.52×10^{14}	7.31×10^{14}	0.48×10^{14}	0.76×10^{14}	0.35×10^{14}	11.42×10^{14}
Daily per capita	1.57×10^2	4.55×10^2	0.30×10^2	0.47×10^2	0.22×10^2	7.11×10^2

* Potential energy in water used to generate hydroelectric power.

** Energy in coal used to generate thermoelectric power.

dioxide to the atmosphere, whose impacts of global climate are not yet fully established.

In addition to its ecological consequences, the scarcity of firewood imposes its economic and social burdens most especially upon the poor. The inhabitants of rural villages in the developing world—usually the women—must walk increasing distances to secure domestic fuel. In terms both of labour and money, half the world's population finds the price of firewood too high to pay.

Unlike fossil fuels such as coal, oil and natural gas, wood is a renewable resource. The question for most developing country villages is not only how to replace firewood with other renewable sources of energy, but also how to supply firewood in an environmentally sound and sustainable way. There are two approaches which seem most promising at present with respect to firewood: using firewood more efficiently, and the more sustainable production of wood via fuelwood plantations. As burnt at present, firewood is not an efficient fuel. Cooking on an open, slow burning fire requires about five times as much energy as cooking on a kerosene stove⁵. A study in Indonesia found that on the usual type of firewood stove 94 per cent of the heat value of the wood was wasted⁶. Simple improvements to stove design cut this loss by about 20 per cent. Cutting the wood some weeks before use and then drying it in the open air reduced the loss by a further 10 per cent, and a new type of cooking pot, partly sunk into the stove, cut heat loss by an additional 30 per cent. In all, the consumption of firewood for cooking was reduced in these ways by 70 per cent. Another means of burning firewood more efficiently is to convert it into charcoal, yet less than 5 per cent of all fuelwood is used in this way.

Trees, unlike oil, are a renewable resource, provided appropriate management and conservation measures are taken. The logical immediate response to the firewood shortage, one that will have many incidental ecological benefits, is to plant more trees in plantations, farms, along roads, in shelter belts, and on unused land throughout the rural areas of the poor countries. For many regions, fast-growing tree varieties are available that can be culled for firewood within a few years, especially if the trees are coppiced (cut off at ground level and the stumps allowed to sprout new shoots). Some calculations, for example, suggest that if improved efficiency in stoves reduces consumption by 50 per cent, a 10 hectare plantation could supply the fuelwood needs of a 1,000-family village in rural India⁷.

To make such land available in heavily-cultivated areas would face considerable political and cultural resistance, and the experience of the tree-planting programmes of many Governments in wood-short countries over the past few decades has not always been encouraging. Nevertheless, if the energy needs of developing country villages are to be satisfied without continuing and increased environmental degradation, some way must be found of growing fuelwood on a sustainable basis in addition to the concerted efforts to harness other renewable sources of energy, especially solar, wind and biogas.

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Protection and improvement of the environment

In many fields first-hand experience and sufficient knowledge is now available to effect a worthwhile improvement in the quality of environment. Efforts have already been made to eliminate oil pollution of the seas, to clean rivers, to safeguard wildlife and landscape and to prevent the misuse of pesticides. The following paragraphs briefly describe successful efforts to improve the quality of the environment in the four areas discussed in this report.

A. Reduction of ozone layer

1. Warning on fluorocarbons

The Food and Drug Administration (FDA) of the United States, which has authority over products such as deodorants, perfumes, hair sprays and anti-perspirants, announced in the last week of November 1976 that the following statement should be printed on the label of aerosol spray cans containing fluorocarbon propellants¹:

Warning: Contains a chlorofluorocarbon that may harm the public health and environment by reducing ozone in the upper atmosphere.

The warning labels will probably be required from early 1977, though no date has yet been set. The products regulated by the FDA account for about 80 per cent of the total release of fluorocarbons into the atmosphere. The Consumer Product Safety Commission of the United States has proposed a separate action to reduce and ultimately eliminate the use of fluorocarbons in aerosol products not regulated by the FDA.

2. Ozone monitoring

Based at the Lawrence Livermore Laboratory in the United States, a global ozone monitoring system collecting data from up to four satellites will go into operation early in 1977². The major objective is to analyse day-to-night variations in ozone levels and to study the impact of natural events such as volcanic eruptions which may inject contaminants in amounts sufficient to alter the chemistry of the ozone cycle. The effect of unusually high radiation levels from solar storms on ozone levels will also be studied. A series of ozone maps will be prepared by relaying 68,000 measurements a day from each satellite to the laboratory via the Airforce Global Weather Central in Omaha, Nebraska where data will be checked against readings made by ground stations in Antarctica, Africa, Australia, Europe, Japan, North America and South America.

3. Nitrous oxide monitoring in air

In order to build a better living environment, about 300 private groups in Tokyo and its surroundings have established an unofficial system for checking the volume of nitrous oxide in the atmosphere. Not less than 22,000 atmospheric measuring stations have been set up which use litmus paper placed in bottles and collected at the end of 24-hour periods to determine the chemical contents of the paper. A comprehensive map of nitrous oxide pollution in the seven regions is being completed and will be publicized³.

B. Cancer

1. Logical framework of cancer research

A team of six scientists at the United States National Cancer Institute and the University of Maryland seems to have made the first step in finding a logical framework for cancer research based on epidemiology. The procarcinogenic polynuclear aromatic hydrocarbons in cigarette smoke are converted into carcinogens by enzymes in the tissues of the lungs. The resultant metabolites can become bound to important cellular molecules including DNA, though it is not very clear that the binding is directly linked with carcinogenesis⁴, however, a correlation has been found between the two in some work with animals. The ability of the lung cells to break down hydrocarbons is related to the amount of actual carcinogen to which the lung tissue is exposed, while the binding of the breakdown products is a measure of the lung cell activity. Experiments have been made on 37 individuals, including 29 with lung cancer, to find out individual differences in the extent of the binding after exposure to a particular hydrocarbon, benzo (a) pyrene, of human lung cells grown in culture. Although many problems are still to be clarified before any definite conclusion about human lung cancer is reached, there seems at least to be a system to work on to find the answers.

2. Substitute for asbestos

A substitute for asbestos (which is associated with lung cancer) has been announced⁵ by a Danish manufacturer and has been named "Low Temperature Ceramic". It can be shaped, pigmented and used in conjunction with other materials such as steel and wood. The new material has already found markets in Japan and the United States.

3. Effective rapid tests for detecting potential carcinogens

The laboratory tests developed in recent years for detecting carcinogenic and mutagenic compounds present in the human environment have recently been evaluated against a group of 120 well-known carcinogens. The so-called Ames test—based on the identification of mutations in the bacterium *Escherichia coli*—and the "cell transformation test"—using cells of Syrian hamster kidney fibroblasts, human diploid lung fibroblasts or human liver cells—proved to be the most reliable out of a total of 6 different experimental procedures⁶.

4. Monitoring of the marine environment for mutagens

To detect chemical compounds capable of inducing genetic mutations and cancer the mussel *Mytilus edulis*,

which is widely distributed in the tidal zone and shallow coastal waters of the northern and southern hemispheres, has been used. Tissues of this mollusc were screened for mutagenic action using yeast cultures as well as bacterial tests. Convincing evidence has thus been obtained from a number of maritime environments. The numerous observed correlations between chemicals showing mutagenic and carcinogenic activity suggest that such agents also represent a possible source of chemically induced carcinogenesis⁷.

C. Land and soil loss

1. Reforestation to prevent silting

The Government of Pakistan planted 22.8 million trees during the 1975 monsoon rainy season (July-August). The major objective is to prevent silting of the country's huge dams such as the Tarbela, the world's largest earth-filled dam and extensive network of rivers and canals⁸.

2. Prevention of erosion

Extensive research has been carried out in the United States to prevent erosion and to preserve eight inches of topsoil for a maximum period. Parallel furrows across the slant of the land keep the fertilizers and rainfall in the sloping and dry earth and help prevent erosion. The life of the topsoil depends on the way it is ploughed and can be preserved for 36 years, 104 years and 2,224 years under straight-line ploughing, contouring and terracing, and a new concept of drilling seeds into untilled, mulched and contoured terraces, respectively. According to the scientists, the last method used by the farmers could safeguard the topsoil for a hundred generations⁹.

3. Date plantation to arrest desert encroachment

A massive date cultivation programme has been planned to arrest the encroachment of the Rajasthan desert, which is swallowing one per cent of India's 306 million hectares of land each year. With the aid of UNDP, the Government intends to plant date palms all along the fringes of the desert on a huge scale. For this purpose about 3,500 date suckers will be imported from California. Meanwhile, the Indian Council of Agricultural Research is exploring the latest techniques in date production, processing and packing¹⁰.

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Conclusion

There are many success stories to indicate that much can be achieved to improve the quality of the environment in countries with very different political and ideological systems. In order to create better conditions of life for a

greater proportion of mankind in an environment which is not being damaged irreparably, an international collaboration on a scale not seen so far in the history of mankind is essential. Planned action towards integrated environmental management is necessary rather than incremental *ad hoc* steps taken for environmental protection. It is for the Governments to consider their own specific national action for environmental control. No general guidelines or specific prescriptions are possible. The basis of national action is so much rooted in the varied conditions in each country that all that can possibly be done is to draw attention to selected environmental problems of major concern at the regional or global levels. However, a top priority for both developed and developing countries should be to broaden their knowledge through exchange of information and experience in the environmental field.

This chapter is based on UNEP/GC/88* submitted by the Executive Director to the Governing Council of UNEP at its fifth session, in May 1977.

Summary of three "Overviews"

Three "overviews" were prepared during 1976 for submission to the fifth Governing Council in 1977. UNEP prepares "overviews" of the subjects selected for detailed attention in order to present issues in relation to the activities being undertaken or planned to deal with them. This helps Governments to identify gaps in action, establish and revise objectives and priorities and allocate responsibilities for action. This has been called "Level One" of the UNEP programmatic process. The "overviews" reflect activities within the United Nations system and outside it.

1. Human settlements

Planning human settlements has become essential because of the rapid rise in world population, rural-to-urban migration and the need to promote social and economic development through improved human settlements. It is generally accepted that the planning and management of human settlements should be an integral part of a nation's development policies, and that the aim should be to improve the social and physical quality of life.

Among United Nations agencies engaged in human settlements activities are: "United Nations Centre for Housing, Building and Planning, the International Labour Organisation, UNESCO, WMO, UN regional commissions, UN Habitat and HS Foundation, UNICEF, UNDP, the World Bank, Office of the UN Disaster Relief Co-ordinator (UNDRO). Other agencies and international bodies also play a role."

Habitat Conference

The first major international conference to be held on the future development of human settlements was Habitat: UN Conference on Human Settlements at Vancouver in June 1976. Its main achievement was the adoption of several recommendations for action at the national level, and international recognition of the importance of action at the sub-regional levels.

Human settlement elements, according to Habitat, refer to land, shelter (housing), physical infrastructure and services. The first general principle adopted by Habitat was that to improve the quality of life of people is "the first and most important objective of every human settlement policy".

Human settlements technology

This covers all the technological inputs, both physical and mental, needed to create human settlements that are relevant to a community, and relate to factors like cost, design, material and the effect (of a particular technology) on the environment.

The appropriate technology should be applied when considering for instance, water supply, waste management, energy sources and transportation. This approach is crucial for improved health standards and for conserving natural resources.

United Nations bodies engaged in major human settlements-related activities are the Centre for Housing, Building and Planning, the UN Industrial Development Organization, ILO, WHO, FAO, UNESCO, the Office of the UN Disaster Relief Co-ordinator and the UN regional commissions. Intergovernmental organizations like the North Atlantic Treaty Organization, the Organization of American States and the International Council for Building Research, Studies and Documentation are also involved.

In keeping with a Habitat recommendation, the regional commissions will play a bigger role in human settlements activities.

Major gaps

Major gaps in knowledge and action have been identified in the overview (UNEP Report No. 1, 1977) on Human Settlements and Habitat.

Gaps in knowledge relate to:

- Ways of identifying suitable building materials which are available locally; finding the appropriate technology to manufacture building materials; low-cost technologies for waste water treatment; appropriate methods for solid waste disposal and/or recycling; and appropriate technologies to protect human settlements against natural disasters.
- Energy conservation in human settlements and technologies to harness renewable sources of energy, especially in rural areas.
- Promoting integrated development in human settlements infrastructures and services.

Gaps in action are:

- Strengthening networks for the exchange of research data and technical information on human settlements technology; transferring appropriate technologies to developing countries and offering them technical aid in this field.
- Training and education at all levels to develop human settlements technology, particularly training of construction personnel.
- Technologies which will make rural areas self-reliant.
- Law-making concerning the siting of industries and the control of waste collection and disposal.

- Setting up or revising relevant building laws and standards for building materials and construction practices, particularly for developing countries.
- Law-making concerning the siting of human settlements in disaster-prone areas.
(See also UNEP Report No. 1, Human Settlements and Habitat)

2. Human and Environmental Health

Health is a basic human need. It is influenced mainly by interaction between man and the biotic, chemical, physical and socio-economic factors in the human environment.

The major causes of disease and death in developing countries are communicable faecal, air and vector-borne diseases aggravated by malnutrition. In industrialized



Safe and adequate water supplies are an integral part of human settlements.

countries they are chronic and non-communicable diseases, like cardio-vascular diseases and cancer, contributory factors being chemical, physical and socio-economic environmental hazards and self-imposed risks like cigarette smoking and improper diet. Often these hazards are the side-effects of technological advance, industrial and agri-

cultural expansion and the complexities of social life.

Control of communicable and non-communicable diseases may be best achieved by control of environmental factors and media. Environmental health management programmes should be an integral part of development programmes.

Organizations active in promoting environmental and human health include WHO, FAO, ILO, UNESCO, UNDP, the World Bank and UNICEF, within the United Nations system. Intergovernmental and non-governmental bodies involved include the Organization for Economic Co-operation and Development, the Council for Mutual Economic Assistance, the International Agency for Research on Cancer and the International Institute for Applied Systems Analysis.

Major gaps

Despite these activities, there are still major gaps in knowledge and action. (See overview on **Health of the People and of the Environment**, UNEP Report No. 2, 1977.)

Some of the gaps in knowledge relate to:

- identifying environmental contaminants, diseases and other factors affecting man;
- epidemiological methods to cope with environmental health problems;
- the study of the causes of some communicable and non-communicable diseases.

Gaps in action include:

- applying available technologies to prevent communicable diseases;
- cost-effective and reliable monitoring systems in developing countries to assess the extent of environmental health problems, including pollution;
- national and international information systems to ensure that data is properly compiled and disseminated, also, warning systems for emergencies and severe pollution;
- legislation to control pollution;
- transfer of technology for rural water supply and disposal;
- integrating environmental health programmes into developing programmes;
- training and education at all levels in integrated environmental health programmes.

3. Natural Disasters

A natural disaster is an extreme physical event, causing physical, social, and economic damage. There are many types of natural disasters, the most important being those due to drought, tropical cyclones, floods and earthquakes.

Effects on man and his environment include: damage to buildings and services; the occurrence of epidemics; destruction of vegetation cover, ecosystems and wildlife; soil erosion; the loss of genetic resources; salinization of arable land; pollution of water supplies; destruction of crops, animals and food reserves leading to malnutrition and less

resistance to disease; and economic losses through effects on commercial activity, public revenue, employment opportunities and services.

The response of the international community, including the United Nations system, was until recently oriented mainly towards relief and rehabilitation. However, the consequences of natural disasters are so serious and extensive that more attention will be given to disaster preparedness and prevention, including mitigation and early warning, to protect both man and his environment.

Disaster prevention and mitigation aimed at long-term reduction of risk, involves measures to reduce the impact of extreme natural events. These include land-use planning, structural protection measures and building regula-

tropical cyclone project, is a major example of a WMO activity in this area. UNESCO is active in the field of seismology, volcanology and studies of tsunamis and floods. World Food Programme provides emergency food assistance to the victims of natural and man-made disasters, and helps in the reconstruction of devastated areas.

Major gaps

Major gaps in knowledge and action have been identified in the overview on natural disasters (UNEP Report No. 2, 1977).

Gaps in knowledge relate to:

- The effects of man-made structures and prevailing land-use practices, particularly in disaster-prone areas, of the loss of coral reefs, mangrove swamps and coastal



Through careful planning and early warning the effects of natural disasters, like the Guatemala earthquake (February 1976), can be minimized.

tions. Disaster preparedness, which includes such elements as warning systems and evacuation plans, is directed towards emergency action. Natural disaster preparedness and mitigation should be part of the long-term planning of all countries, especially in disaster-prone areas.

Within the United Nations system those most deeply concerned with natural disasters are UNDRO, WMO, UNESCO, World Food Programme and the regional commissions. UNDRO plays a central role in disaster relief activities. WMO is primarily concerned with natural disasters caused or aggravated by meteorological phenomena. The World Weather Watch programme, including the

forest belts, of draining swamps and wetlands, and of deforestation;

- Adequate building designs and use of suitable building materials in disaster-prone developing countries;
- The precise location of disaster-prone areas and the need for risk assessment and systematic vulnerability analyses;
- Forecasting and prediction techniques for floods, tropical cyclones, storm surges and possibly earthquakes;
- Flood plain management;
- Methodologies for assessment of social, economic and environmental impacts of disasters.

Gaps in action are:

- Co-ordinated programmes of post-disaster survey and analysis;
- Programmes of public awareness and education to promote disaster preparedness and prevention at all levels;
- Inclusion of natural disaster preparedness and mitigation in national development planning;
- Expansion and improvement of monitoring systems for prediction and warning in disaster-prone countries.

Highlights of the Environment Programme

Introduction

This chapter briefly outlines the progress made in developing and implementing the environment programme during 1976.

UNEP's environment programme represents "Level Two" of the programmatic approach. Thus it constitutes the programme of action required to meet the objectives in the environmental field by establishing an operational framework which points out the principal actions to be taken, identifies the principal "actors" involved, and provides a basis for the identification and elaboration of specific actions and projects.

In 1975 the Governing Council approved the objectives and strategies of the environment programme, and thereby gave a formal structure to activities in each priority subject area and functional task. As a result, a feature of the development of the environment programme in 1976 was greater concentration of financial and other resources upon aspects which the Council had identified as important; this tendency was reinforced by the decision of the fourth session of the Governing Council to approve a list of concentration areas from within the programme.

The order in which this account of the programme areas is given follows UNEP's concept of the programme as a whole and illustrates the links between the functional tasks and priority subject areas. The functional tasks are environmental assessment: Earthwatch (including GEMS* and environmental data); environmental management and law; and the supporting measures of technical assistance, education, training and information. The priority subject areas are human settlements and human health, terrestrial ecosystems (including the sub-area of arid lands**), environment and development, oceans (including the subject of the Mediterranean**), energy and natural disasters**.

The relationship between subject areas and functional tasks is complex, but in essence involves:

- assessing environmental problems and trends;
- undertaking activities under each priority subject area to identify the management action required to deal with the problem;
- stimulating measures to support assessment and management;
- consolidating management experience gained through activities in priority subject areas in guidance on environmental management.

*GEMS = Global Environmental Monitoring System.

**An evaluation of these four (one functional task and parts of three subject areas) is given later in this chapter.

The following account, which is necessarily highly selective, follows that sequence.

1. Functional task: environmental assessment (Earthwatch)

In the functional task of the *environmental assessment*, 1976 saw some important developments in Earthwatch, which includes activities relating to GEMS, IRS, IRPTC, and the assessment of basic human needs and of outer limits. GEM's activities are described below. The International Referral System for Sources of Environmental Information (IRS) made substantial progress: at the end of 1976 the first edition of the IRS International Directory and Index was published, the number of national focal points had risen to 70, there were over one thousand sources registered and six regional workshops had been held. The International Register for Potentially Toxic Chemicals (IRPTC) was established as a programme activity centre in August 1976, temporarily located at WHO headquarters in Geneva; the IRPTC scientific advisory committee first met at the end of the year. A methodological study was initiated on the assessment of basic human needs and the resources required for their satisfaction. In the outer limits programme, the principal focus was preparations for the Ozone Conference set for March 1977.

An important aspect of environmental assessment is the development of national systems of environmental data. In the course of joint programming with the Economic and Social Affairs Department of the United Nations in October 1976, agreement in principle was reached on future co-operation in this field.

2. Priority subject area: human settlements and human health

The most significant event was the Habitat Conference on Human Settlements in Vancouver, the recommendations of which covered planning, technology and management issues, and largely confirmed UNEP's strategies. Steps were taken by UNEP to develop regional networks of institutions and projects on human settlements technology and co-operate in training programmes for human settlements managers. Under human health, further progress was made in co-operation with WHO in publishing criteria documents on pollution dose/effect relationships, through joint programming with WHO on the identification of additional areas for collaboration in the environmental aspects of disease control, and in training in the control of food contamination. Also in 1976, arrangements were worked out for the organizational responsibility for the secretariat of the United Nations Scientific Com-

mittee on the Effects of Atomic Radiation to be transferred to UNEP. The fourth session of the Governing Council was informed of the development of global plans of action for the environmentally-sound control of schistosomiasis, malaria and cotton pests, and steps have been taken to begin implementing these.

3. Priority subject area: terrestrial ecosystems

Important developments in 1976 under tropical woodlands and forests include preparations for joint UNESCO/UNEP pilot projects in the ecologically-sound management of such ecosystems and, in co-operation with the International Development Research Centre, preparations for a programme to demonstrate the technique known as agrisilviculture or agroforestry — a method of raising forest crops in combination with agricultural ones.

In the area of soils, UNEP co-operated with the International Federation of Institutes for Advanced Study and the State Committee for Science and Technology of the Council of the Ministers of the USSR in organizing a workshop on global soil problems at Samarkand in June 1976, and, in collaboration with the Economic Commission for Europe, held a symposium on the problems associated with opencast mining.

The objectives and strategies for UNEP's programme in water were revised at the fourth session of the Governing Council, and preparations were laid in 1976 for an ambitious programme of pilot demonstration projects to promote ecologically-sound methods of improving water supply. Attention was also given in 1976 to preparations for the 1977 United Nations Conference on Water, including a paper on water activities undertaken within the United Nations system.

The fourth session of the Governing Council received overviews on the subjects of genetic resources, national parks and reserves and endangered species of wildlife. Important advances were made in promoting the establishment of a network of microbiological resource centres in all the regions of the developing world to enable them to make the best use of micro-organisms. Developments also included the first conference of parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (its secretariat is provided by IUCN on behalf of UNEP) which was held at Berne in November 1976, and preparations for a convention on the conservation of migratory species. Important developments in arid and semi-arid lands activities are described in some detail below.

4. Priority subject area: environment and development

The fourth session of the Governing Council gave special attention to this subject and considered the Executive Director's report on it, as well as the related ones on the irrational and wasteful use of natural resources, and on eco-development. Through joint programming with such UN organizations as the Department of the Economic and Social Affairs of the U.N., UNCTAD, ECE and ILO, as

well as in its contacts with the World Bank and UNDP, UNEP has sought to promote an awareness amongst members of the UN system of the importance of incorporating environmental considerations into all UN development programmes.

The Environment Co-ordination Board has also given attention to this issue. Under its aegis, two joint examinations were launched of activities in which its members are engaged, in order to identify the impact of water development and of industrial processes on environmental health. Moreover the Board initiated a more general systematic study of its members' activities to establish any adverse environmental impacts of these, and the actions already taken, or required, to reduce these impacts.

Work began on developing a methodology for assessing the non-satisfaction of basic human needs and the key resources required for their satisfaction, and on the development of an international network of pilot projects on environmentally sound and appropriate technologies. A seminar was held on the environmental impacts of the motor vehicle industry, and a consultative meeting of experts was held in Paris in December 1976 to review the objectives of the programme in relation to the environmental problems of specific industries and to evaluate progress being made towards those objectives. From this, guidelines emerged for the development of this part of the environment programme.

5. Priority subject area: oceans

Overviews were presented to the fourth session of the Governing Council on marine pollution and living marine resources, the two aspects of the global programme for oceans. At the regional level, there have been several important developments in the Mediterranean region, which are described below. In the Gulf region, steps were taken to prepare for an intergovernmental meeting later in 1977 to consider a draft action plan on the development and protection of the marine environment there. A UNEP-organized mission visited 14 countries of the Gulf of Guinea region during 1976, and from this and subsequent activities, the foundations have been laid for the development of a regional action plan. A scientific workshop was organized in April 1976 in Penang, in co-operation with FAO and IOC, to develop a research and monitoring programme for the East Asian seas. A comprehensive plan for the protection of the Red Sea against pollution was adopted in January 1976 by the Governments concerned, and UNEP is supporting its implementation. In collaboration with ESCAP, proposals were developed to work out a plan for environmental management in the South Pacific region.

6. Priority subject area: energy

The fourth session of the Governing Council received the Executive Director's report on the impact of the production and use of *energy* on the environment. Feasibility studies were carried out on experimental centres for renewable forms of rural energy in Sri Lanka and Senegal and the Government of Sri Lanka was given technical assistance to set up such a centre.

7. Priority subject area: natural disasters

Activities in this area are described below.

8. Functional task: supporting measures

The main focus of activities in the field of environmental education was planning for the UNESCO/UNEP inter-governmental conference, to be held in Tbilisi, USSR, in October 1977, and steps preparatory to the establishment of a programme activity centre for environmental education and training in the Africa region.

Important developments took place in the information programme with the issue of a monthly UNEP newsletter, *Uniterra*, and the regular production of *Report to Governments*. Erik Eckholm's book *Losing Ground*, published with UNEP support, has been notably successful in drawing attention to the scale of natural resource destruction, especially of soils and vegetation in the developing world. This theme was also emphasized in World Environment Day, through, for example, the film *Water — Vital Resource for Life*.

In respect of technical assistance, steps were taken to establish the clearing house, which now has the capacity to match requests with offers of technical assistance. UNEP regional advisory teams were established for Africa, Latin America, Asia and the Pacific, and for West Asia. A study tour took place to China on the subject of energy and the environment. The opportunity was taken to integrate many technical assistance, information and training activities with UNEP projects during 1976.

9. Functional task: environmental management and law

In *environmental law*, an important preoccupation has been the continued work of the group of experts set up to formulate principles and guidelines to promote harmonious utilization and conservation of natural resources shared by two or more states. Another group of experts met towards the end of the year to consider the problems of liability and compensation for pollution and environmental damage. The fourth session of the Governing Council received the first edition of what will become a regularly updated publication reporting on the state of international conventions and agreements concerning the environment. In *environmental management*, agreement was reached with ECLA on the steps needed to develop a comprehensive programme for environmental management of the Caribbean area.

Four areas selected

In order to illustrate more fully the development of the programme, four areas have been selected for a relatively detailed account of events in the year under review. These areas — GEMS, the Mediterranean, arid lands and natural disasters—demonstrate the success and difficulties encountered in the programme, and have been the subject of a thorough internal evaluation, undertaken by UNEP at the request of the Committee on Programme and Co-ordination.

GEMS:

The Global Environmental Monitoring System — an element of Earthwatch

At the third session of the Governing Council in 1975, the Executive Director was requested to "accelerate the development of GEMS . . . by convening small groups of governmental experts to work in close harmony with the relevant United Nations bodies in designing and implementing the first stage of GEMS . . ." (decision 29(III)).

GEMS may be viewed as a co-ordinated effort on the part of Member States, United Nations agencies and UNEP to gather data for the rational management of the environment. It is not operational in the sense of actually conducting monitoring activities nor is it an important funding source. GEMS receives about \$2 million a year from the Fund of UNEP primarily to co-ordinate and catalyse monitoring activities in accordance with the priorities and the seven programme goals for GEMS determined by the 1974 Intergovernmental Meeting on Monitoring and subsequently endorsed by the Governing Council. In its catalytic and co-ordinating role, GEMS reflects both the philosophical and practical essence of UNEP as a whole.

Baseline stations

At the time of the Stockholm Conference in 1972, there was, with the exception of radionuclides, little or no comprehensive monitoring data on man-induced changes in the biosphere and the effects of these changes on the global and regional environment. A basic recommendation of the 1974 Intergovernmental Meeting on Monitoring was that a global network of baseline stations should be built under UNEP auspices, incorporating existing capabilities and establishing new ones where needed, with special attention being given to the developing countries.

Air pollution — baseline and regional Stations

Since 1974 WMO and UNEP have substantially expanded the atmospheric monitoring network. By early 1976, this network included about 120 planned or established regional* stations in 59 countries, half of which are presently operational. Data for the years 1972, 1973 and 1974 are now available. Carbon dioxide data from all the operational baseline stations will be published with 1975 regional data. Other data from baseline stations are being published by the country in which the station is located.

Pollution monitoring in the oceans

Governments were aware from the beginning of the difficulties involved in global ocean monitoring and generally favoured a regional approach to the problem. Following a decision made at the second Governing Council, in 1974, the first regional attempt at monitoring was made in the context of the Mediterranean Action Plan which was adopted at Barcelona in 1975. In the following year, 1975, the Governing Council called for the expansion of the UNEP/IGOSS** North Atlantic pilot project on marine pollution (oil) from solely monitoring petroleum hydro-

*The basic difference between regional and baseline atmospheric monitoring stations concerns the stringency of the siting criteria.

**Integrated Global Ocean Station System.

carbons along shipping lanes and tanker routes, to the monitoring of additional pollutants in the open ocean, away from shipping lanes (decision 20(III)).

Monitoring of natural resources

UNEP and FAO have been collaborating since 1975 in a pilot activity in West Africa to survey the state of, and changes in, the tropical forest cover. In this way, critical areas of degradation can be identified and monitoring methodologies and vegetation classifications can be developed and refined for use in surveying the forest cover in other areas of the tropical belt. Another UNEP/FAO exercise, begun in late 1975, deals with assessing actual and potential soil degradation in Africa north of the Equator and the Middle East. Part of this work will be available for the 1977 Desertification Conference.



Health-related monitoring, such as this test for food contaminants, is a UNEP-supported activity.

Health-related monitoring

In the area of health, activities include water quality monitoring and atmospheric pollution monitoring (SO_2 and particulates) in urban areas. The water quality activity is a joint WHO/WMO/UNESCO/UNEP venture developed through 1975, which has as its immediate objective an improvement of the validity and comparability of regional water quality monitoring measurements. A longer term objective is to assess the transport, levels and trends of particularly hazardous water pollutants on a global basis in order to identify areas where there may be a risk to health through pollution. The urban air pollution monitoring activity (a joint UNEP/WHO venture) has so far produced a manual on selected methods of measuring air pollutants and data (published) for 1973, 1974 and 1975.

UNEP also gave its support to India's Council of Scientific and Industrial Research in 1975 to produce an inven-

tory on institutions in the ESCAP region with capabilities in monitoring and assessing air and water pollution.

Development of GEMS

Refinements in the development of GEMS have been carried out within the UN system through periodic meetings of the subgroup on GEMS of the ECB working group on Earthwatch, which has helped to refine the concept of GEMS and encourage co-ordination.

It is now recognized that it may often take considerable time to develop appropriate monitoring methodologies and to identify meaningful trends in environmental conditions, even when critical environmental indicators have been successfully identified. Consequently the progress in implementing a co-ordinated set of monitoring activities has been slower than was first anticipated. GEMS has also had to catalyze the inception and development of many new global and regional monitoring activities, in close co-operation with the United Nations agencies, and in some cases, governments, in order to adequately address those problems conceived as deserving priority.

Long-term objectives of GEMS

These are, firstly, to provide sound data on the possible or probable approach of certain critical indicators of global environmental health towards those unacceptable limits which UNEP describes as "the outer limits". Secondly, GEMS must provide continuing data to environmental management authorities to assist in the process of decision making.

Although GEMS is developing somewhat slowly, an important beginning has been made and the foundation has been laid and is in the process of being broadened. The second phase of the development of GEMS, which begins in 1977, should achieve increasing data output and a consolidation of sets of related monitoring activities so that a concerted and co-ordinated attack on certain priority areas will be achieved.

The Mediterranean —an element of Oceans

Legislative authority for this sub-area rests with the Stockholm Action Plan and subsequent Governing Council decisions. At a meeting held in London, June 1971, before the Stockholm Conference of 1972 which established UNEP, it was agreed that the most efficient way to attack the problem lay at the regional level.

After extensive preparatory activities involving many United Nations bodies, UNEP convened the Intergovernmental Meeting on the Protection of the Mediterranean at Barcelona (28 January - 4 February 1975). It was attended by representatives of 16 states bordering the Mediterranean Sea: Algeria, Egypt, France, Greece, Israel, Italy, Lebanon, Libyan Arab Republic, Malta, Monaco, Morocco, Spain, Syrian Arab Republic, Tunisia, Turkey and Yugoslavia. Observers included the three relevant United Nations regional commissions, specialized agencies, Organization for Economic Co-operation and Development and the Organization of African Unity.

On the basis of proposals presented by UNEP, these 16 states approved an Action Plan consisting of four components: legal, scientific assessment, integrated planning, institutional and financial arrangements. The four components are interdependent.

1. Legal component (environmental legislation)

Drafts of three international agreements were presented at the Barcelona meetings in 1975. They were:

- A Convention for the protection of the Mediterranean Sea against pollution;
- A Protocol for the prevention of pollution of the Mediterranean Sea by dumping from ships and aircraft;
- A Protocol concerning co-operation in combating pollution of the Mediterranean Sea by oil and other harmful substances in cases of emergency.

2. Scientific assessment

There is currently little data to diagnose the severity of the pollution in the Mediterranean. This is largely because there are no common or uniform standards of measurements between national scientific institutions in the area. In addition, very little of the work already done is correlated.



Tests are taken of a seabed sample to assess pollution in the Mediterranean Basin.

Acting on recommendations based on results of workshops and on a feasibility study of the capabilities of existing national research institutions, a Mediterranean Pollution Monitoring and Research Programme was launched jointly by UNEP and the relevant United Nations agencies and IAEA. A Directory of Mediterranean Marine Research Centres has been published in January 1976 containing information on about one hundred institutions which were surveyed. The seven pilot projects of the Monitoring and Research Programme involve more than seventy national institutions in co-operative programmes.

3. Integrated planning (environmental management)

Many development activities, both present and planned, have impacts on the environment of the Mediterranean. In 1973-4 such activities were identified in order to evaluate how severe the impact might be and how to either reduce or prevent the severity of this impact. UNEP, co-operating with other international bodies, has studied the means to

assess the likely environmental impacts, and to design and apply appropriate safeguards. Current projects with beneficial environmental impacts include various fisheries projects of FAO, sanitation activities of WHO, and industrial waste treatment assisted by UNIDO. Intergovernmental organizations such as OECD and nongovernmental organizations are also carrying out projects of a similar nature.

Several expert meetings were held during 1976 to co-ordinate activities so as to better utilize the region's resources. Also, during 1976, a longer-term planning exercise was being prepared known as the "Blue Plan". Several priorities were identified for immediate action.

4. Institutional and financial arrangements

The main activity was the decision by governments at the second Barcelona Conference in 1976 to set up, with IMCO's help, a regional oil spill control centre in Malta. The main objective of the centre would be to help coastal states of the region take co-operative and timely steps to prevent damage to their coastal resources from massive and accidental pollution, especially petroleum. Late in 1976, the centre was established jointly by IMCO/UNEP in Malta.

Impact of the Plan's output

It is perhaps too early to judge the full effectiveness of the steps taken. The Mediterranean governments, as the principal users, are best qualified to judge the quality of services performed through UNEP by the United Nations system and other organizations. The prompt signing of the three international agreements early in 1976 is a measure of success. So was the technique of directly consulting with the scientific community of the region (Monaco 1974) to establish priorities. These priorities, established by the regional scientific community for the UNEP programme, were approved by national decision-makers at the first Barcelona Conference in 1975. Within two years almost all the governments concerned had authorized active participation of more than seventy national institutes for these co-operative programmes. The impact on public opinion in the region has also shown a dramatic increase in environmental awareness.

The emphasis has been on developing networks among existing institutions—rather than in setting up new ones—to facilitate and strengthen links throughout the region.

It is also too early to gauge the success of the long-term objectives of the subprogramme (i.e. "to prevent, abate and combat pollution of the Mediterranean Sea area and to protect and enhance the marine environment in that area"). As there has been no established standards by which to measure or compare the condition of the Mediterranean, one aim of the scientific portion of the Mediterranean Action Plan is to establish the trends of significant pollutants so as to help the governments decide whether to try to reduce these trends, and to help provide the information needed for cost-benefit analysis and risk assessment. Until such data become available, governments will have no way by which to measure either the trends or whatever effects upon these trends might result from their concerted national efforts.

The future of the Plan

In keeping with its policy, UNEP plans to reduce the level of its involvement, in terms of both personnel and finances, in the Mediterranean activities, once its catalytic role is completed.

The Executive Director plans to set up a "programme activity centre" on regional seas to direct and co-ordinate UNEP activities in this area, which will involve the Gulf, the Red Sea, the Gulf of Guinea, the Malacca Straits and the Caribbean.

Arid and semi-arid lands ecosystems

At successive Governing Councils from 1973 until 1976 the subject of arid lands has received increasingly greater attention, with the focus on action to help stop desert encroachment (Governing Council, 1975) and a decision to concentrate actions on improving the productivity of these ecosystems (Governing Council 1976).



Research into the processes and causes of desertification will help to fight it.

In 1975 an inventory of current research and development actions and programmes was carried out in order to identify the gaps in the United Nations systems' programmes on arid and semi-arid ecosystems, and to define possible additional UNEP activities. These gaps were

identified and presented in a report to the third session of the Governing Council in 1975. They are:

- prevention of loss of productive soils caused by erosion, salinization, desertification, laterization;
- management of rangelands in the arid and semi-arid ecosystems;
- research programme aimed at integrated development
- assessment of kinds of afforestation and deforestation in these ecosystems and programmes of conservation and restoration.

Co-ordination by UNEP with other United Nations agencies in this area is carried out through joint programming exercises. FAO, UNESCO and WMO are the major agencies involved.

The Executive Director has established an internal interdisciplinary task force on arid and semi-arid ecosystems which ensures in-house co-ordination of activities, evaluates the subprogramme, and sets new actions.

Evaluation

In the course of developing the arid lands programme, frequent use has been made of intergovernmental meetings and experts from the regions and countries directly affected. A project on the Ecological Management of Arid and Semi-arid Rangelands (EMASAR), for instance, is currently under way in North Africa and West Asia. The next phase of the arid lands programme will also achieve a more action-oriented character, demonstrating means of improving the productivity of arid and semi-arid ecosystems. Whether this series of activities has triggered a greater awareness of these problems, and generated independent initiatives in the affected countries is still uncertain.

The two United Nations Conferences on Water and Desertification, due in 1977, and their plans of action will have far-reaching implications and will give further impetus to existing international activities. In the final analysis achievement of these objectives will depend on the decisions and actions of the states concerned.

So far, UNEP's activities in this area has concentrated on defining concepts, searching for suitable approaches and setting up effective co-ordinating mechanisms. The numerous supported activities have contributed to programme formulation and development and have made UNEP more aware of the existence of many scattered and often overlapping activities and of research results which have not been applied. They have also set a firm basis for subsequent activities in this field.

Natural Disasters

At the second session of the Governing Council in 1974, natural disasters was designated a priority subject area. Recommendation 18 of the United Nations Conference on the Human Environment in 1972 was devoted entirely to natural disasters (A/CONF.48/14/Rev. 1). Following consultations between UNEP, UNDRO, UNESCO and WMO, a programme was submitted to the Governing Council in 1975 (UNEP/GC/31).

In 1975 a General Assembly resolution (3440 (XXX), para. 9(g)) introduced a new element to this subprogramme. It requested United Nations organs and other bodies concerned to co-operate with UNDRO to formulate an international strategy for disaster prevention. This resolution was reflected in a Governing Council decision made in 1976 (61(IV)).

UNEP has achieved co-ordination in this field through informal and formal interagency meetings and bilateral contacts with the agencies concerned. A Level-One overview on Natural Disasters is to be completed early in 1977.

Among relevant projects supported by UNEP are a study of the state of the art in disaster prevention and mitigation carried out jointly with WMO, UNDRO and UNESCO: a conference on Man's Impact on Climate held by WMO and a world survey of disaster damage.

Evaluation

Since this part of the programme was developed only recently, it is still too soon to assess the impact on users or to give an evaluation of the influence of the United Nations system. It is evident, however, that the area of co-operation within the United Nations has broadened through the involvement of an increasing number of organizations in the course of UNEP's continuing consultations.

This particular subprogramme has been implemented slowly and with caution pending the results of the Level-One overview. Once the overview is completed a more expanded subprogramme will be planned jointly with all the agencies concerned. This will be related to the gaps in knowledge and action identified at Level One and to the requests of the Governing Council.

The Environment Fund

Introduction

The total sum of pledges made by Governments to the Fund for the period 1973-7 is \$107 million from 69 countries.

For 1976, the total estimated resources amounted to \$24,310,809, out of which \$23,715,516 had been paid in as at 1 February 1977. This represents the best annual payment record to date, with a smaller outstanding balance than in any previous year.

The Governing Council authorized the Executive Director to allocate \$34,000,000 for Fund programme activities in 1976, and authorized a Fund Programme Reserve at \$1,000,000.

Due to an anticipated drop in resources between March and August 1976, as a result of changes in pledges by certain member states or rescheduling of payments by certain major contributors, the Executive Director was instructed by the Governing Council "to be guided by the anticipated cash inflows of voluntary contributions and to take due account of the level of available resources, and of the currency composition of those resources, in order to avoid a deficit situation."

The Fund therefore restricted new commitments for 1976 to \$2 million over the May-August period, for projects in an advanced state of preparation, and to \$1 million only in the September-December period. As a result of this temporarily unusual situation, entire commitments in 1976 totalled only \$23.5 million.

Despite these stringent measures, total expenditures for 1976, although well short of the commitments, represented an increase over previous years. The unspent portion of 1976 commitments was carried forward to 1977 as a claim on the current year allocation.

The average cost to UNEP per project rose from \$90,000 in 1974 and \$209,000 in 1975 to \$231,000 in 1976. Of the 84 projects approved in 1976, 41 were small projects costing under \$100,000 each, 14 were projects costing between \$100,000 and \$200,000 each, while 29 were large projects each costing \$200,000 or more. However, small projects accounted for only about \$1.5 million, the medium projects over \$2 million, while the larger ones totalled \$15.5 million. The value of the 84 projects approved in 1976 is \$19,453,964.

Since the Fund is essentially global in nature, this is reflected in the geographical distribution of the Fund programme activities for 1976 projects. As of 31 December 1976, for instance, a total of almost \$12 million was allo-

cated to global projects, while \$7.5 million was allocated to regional projects.

The Fund represents "Level Three" of the programmatic process of UNEP, being those activities or parts of activities identified within the programme at "Level Two" which are selected for support by the Environment Fund.

Estimates of resources for 1973-7*
(in US dollars equivalent).
Status as at 31 March 1977

Country	Pledge for 1973-7	Estimated 1973-7	1973	1974	1975	1976	1977
Argentina	160,000	160,000	—	40,000	40,000	40,000	40,000
Australia	2,500,000	2,500,000	500,000	500,000	500,000	500,000	500,000
Austria	800,000	800,000	—	200,000	200,000	200,000	200,000
Belgium	1,250,000	1,250,000	250,000	250,000	250,000	250,000	250,000
Botswana	5,232	6,385	1,497	1,435	1,150	1,150	1,153
Brazil	60,000	80,000	—	20,000	20,000	20,000	20,000
Bulgaria	8,230	8,230	—	—	—	4,115	4,115
Byelorussian SSR	53,302	53,302	—	—	18,919	17,137	17,246
Canada	5,000,000	5,000,000	1,000,000	—	—	1,500,000	2,500,000
(100,000 received in 1972)							
Chile	6,000	6,000	—	—	2,000	2,000	2,000
China	421,102	421,102	263,207	—	—	—	157,895
Cuba	49,080	121,806	24,540	24,540	24,242	24,242	24,242
Cyprus	1,000	2,000	—	—	—	1,000	1,000
Czechoslovakia	207,658	207,658	—	50,590	52,356	52,356	52,356
Denmark	1,600,000	1,600,000	—	400,000	400,000	210,000	590,000
Egypt	20,000	30,000	—	—	10,000	10,000	10,000
Finland	700,000	900,000	150,000	150,000	200,000	200,000	200,000
France	6,525,286	6,525,286	1,360,671	1,242,236	1,445,783	1,276,596	1,200,000
German Dem. Rep.	324,526	324,526	—	81,469	81,469	78,588	83,000
Germany, Fed.							
Rep. of	8,035,356	8,035,356	—	2,407,000	1,941,930	2,012,786	1,673,640
Ghana	39,446	70,192	—	11,023	19,723	19,723	19,723
Greece	15,000	20,000	—	5,000	5,000	5,000	5,000
Hungary	91,535	91,535	—	20,080	22,989	24,462	24,004
Iceland	14,000	18,000	2,000	4,000	4,000	4,000	4,000
India	390,907	490,907	95,780	95,780	99,347	100,000	100,000
Indonesia	30,000	40,000	—	10,000	10,000	10,000	10,000
Iran	260,000	260,000	40,000	40,000	40,000	40,000	100,000
Iraq	43,638	58,638	—	15,000	13,573	15,065	15,000
Ireland	33,987	33,987	—	—	—	17,485	16,502
Israel	10,000	30,000	—	10,000	—	10,000	10,000
Italy	1,600,000	1,600,000	—	400,000	400,000	400,000	400,000
Jamaica	10,000	14,000	2,000	2,000	2,000	4,000	4,000
Japan	10,000,000	10,000,000	1,000,000	1,500,000	2,000,000	2,500,000	3,000,000
Jordan	1,000	4,000	1,000	—	1,000	1,000	1,000
Kenya	150,000	150,000	30,000	30,000	30,000	30,000	30,000
Kuwait	133,300	133,300	—	—	33,300	50,000	50,000
Lesotho	2,000	3,000	—	—	1,000	1,000	1,000
Liberia	4,500	7,500	1,500	1,500	1,500	1,500	1,500
Luxembourg	30,000	40,000	—	10,000	10,000	10,000	10,000
Malta	6,977	6,977	1,350	1,315	1,315	1,380	1,617
Mexico	800,000	1,000,000	200,000	200,000	200,000	200,000	200,000
Netherlands	1,500,000	1,500,000	300,000	300,000	300,000	300,000	300,000
New Zealand	325,866	325,866	79,221	72,360	72,419	53,139	48,727
Nigeria	124,000	124,000	20,000	20,000	20,000	32,000	32,000
Norway	2,230,088	2,230,088	421,277	437,368	484,157	432,984	454,302
Pakistan	5,000	10,000	—	—	—	5,000	5,000
Peru	7,000	7,000	1,000	1,000	1,000	2,000	2,000
Philippines	40,000	50,000	10,000	10,000	10,000	10,000	10,000
Poland	200,804	200,804	—	50,201	50,201	50,201	50,201
Portugal	8,000	8,000	—	2,000	2,000	2,000	2,000
Qatar	10,000	40,000	—	10,000	10,000	10,000	10,000

*Estimates of future resources do not imply an undertaking of any kind on the part of countries and do not prejudice constitutional processes with respect to future contributions.

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Country	Pledge for 1973-7	Estimated 1973-7	1973	1974	1975	1976	1977
Romania	50,300	50,300	10,060	10,060	10,060	10,060	10,060
Saudi Arabia	15,000	60,000	15,000	—	15,000	15,000	15,000
Senegal	1,104	3,104	—	1,104	—	1,000	1,000
Singapore	5,000	5,000	1,000	1,000	1,000	1,000	1,000
Spain	800,000	1,000,000	200,000	200,000	200,000	200,000	200,000
Sri Lanka	500	2,000	—	500	500	500	500
Sudan	3,866	4,866	1,000	933	933	1,000	1,000
Swaziland	2,727	9,648	2,727	—	2,307	2,307	2,307
Sweden	5,000,000	5,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Switzerland	1,188,922	1,188,922	—	—	405,268	387,222	396,432
Turkey	30,000	30,000	—	—	—	14,459	15,541
Ukrainian SSR	127,872	127,872	—	—	43,243	42,189	42,440
USSR	10,474,888	10,474,888	—	—	3,541,892	3,455,542	3,477,454
United Kingdom	3,880,728	3,880,728	469,750	641,278	1,013,171	881,942	874,587
United Republic of Tanzania	2,976	5,984	—	—	—	2,976	3,008
United States of America	40,000,000	30,000,000	4,300,000	5,000,000	3,200,000	7,500,000	10,000,000
Yugoslavia	100,000	100,000	20,000	8,989	—	35,000	36,011
Zaire	100,000	125,000	25,000	25,000	25,000	25,000	25,000
TOTAL	107,630,598	98,670,652	11,799,580	15,514,761	18,490,747	24,317,106	28,548,458

Projects approved in 1976

PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
01—HUMAN SETTLEMENTS, HUMAN HEALTH. FP/0104—General development of human settlements (formerly 0101)					
FP/0104-76-01 Co-ordination of the demonstration projects in the Philippines and Indonesia and regional activities for an integrated approach for improving slums and marginal settlements.	Asia and the Pacific	Centre for Housing, Building and Planning (CHBP)	575,000	370,000	February 1976 December 1978
FP/0104-76-02 Integrated approach for improving slums and marginal settlements: demonstration projects in the Philippines	Asia and the Pacific	Philippines National Housing Authority	1,261,000	689,000	May 1976 June 1978
FP/0104-76-03 Integrated approach for improving slums and marginal settlements: demonstration projects in Indonesia	Asia and the Pacific	Indonesia National Commission on Environment	1,943,000	834,000	July 1976 June 1978
FP/0104-76-04 Level One overview: general development of human settlements	Global	Internal	28,000	28,000	May 1976 October 1976

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PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/0104-76-05 Integrated ecological studies on human settlements as a basis for decision-making (Phase II).	Global	UNESCO/WHO/INTECOL	630,000	247,800	October 1976 December 1977
FP/0106—HUMAN SETTLEMENTS TECHNOLOGY					
FP/0106-76-01 Human settlements technology programme for Africa and the West Asia region.	Africa and West Asia	ECA/ECWA	36,000	17,000	5 days February 1976
FP/0106-76-02 Expert group meeting to prepare guidelines, recommendations and specific proposals for implementation of a human settlements technology programme for the ECLA region	Latin America	ECLA	14,485	9,645	December 1975 March 1976
FP/0106-76-03 Level One overview: human settlements technology	Global	Internal	28,000	28,000	June 1976 November 1976
FP/0106-76-04 Survey of subregional research and demonstration centres—A study for the creation of co-operative effort in demonstration projects in human settlements technology.	ECWA region	ECWA/CHBP	27,000	21,000	October 1976 March 1977
FP/0106-76-05 Survey of subregional research and demonstration centres—A study for the creation of co-operative effort in demonstration projects in human settlements technology	Africa	ECA/CHBP	52,000	40,000	October 1976 March 1977
FP/0107—ENVIRONMENTAL HEALTH					
FP/0107-76-02 Level One overview: human and environmental health	Global	WHO	38,000	32,000	March 1976 September 1976
FP/0107-76-03 International Register of Potentially Toxic Chemicals (IRPTC) (Phase II)	Global	Programme Activity Centre	1,358,000*	1,289,000	January 1976 December 1977
FP/0108—PEST MANAGEMENT SYSTEMS					
FP/0108-76-02 Development of ecological elements in pest management systems for species of importance in agriculture and human health	Global	ICIPE	1,464,145	701,745	October 1976 December 1978

*Balance provided by WHO

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PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
FP/0108-76-03 Near East inter-country programme for the development and application of integrated pest control in cotton growing	West Asia	FAO	1,843,184	249,000	January 1977 December 1978
FP/0108-76-04 African inter-country programme for the development of integrated pest control in cotton growing	Africa	FAO	1,849,184	150,000	January 1977 December 1978
FP/0108-76-05 Implementation and co-ordination of the UNEP/FAO co-operative global programme for the development and application of integrated pest control in agriculture	Global	FAO	206,725	144,950	August 1977 July 1978
FP/0301—TRAINING AND EDUCATION					
FP/0301-76-01 International programme on environmental education and training of engineers and allied professions (P.A.1.)	Global	UNESCO	27,000	19,000	October 1975 May 1976
FP/0301-76-02 International programme in environmental management education (IPEME)	Global	Centre for Industrial Studies (CEI) Geneva	420,000	275,000	January 1976 December 1977
FP/0301-76-03 Training course for national planners and decision-makers	Asia and the Pacific	ADI	180,000	140,000	January 1976 December 1977
FP/0301-76-04 Staff training and teaching aids for the Arab Maritime Transport Academy, Alexandria	West Asia	IMCO	53,000	50,000	January 1977 December 1978
FP/0301-76-05 International programme on environmental education and training of engineers	Global	UNESCO	800,000	600,000	October 1976 March 1978
FP/0301-76-06 Reinforcement of international post-graduate training courses in integrated environmental research and management for specialists from developing countries	Global	UNESCO	1,772,000	250,000	September 1975 August 1978
FP/0301-76-07 Interregional training programme for developing countries in the environmental aspects of industrial development, University of North Carolina, USA	Global	UNIDO	40,000	35,000	March 1975 April 1975

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PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/0302—TECHNICAL ASSISTANCE					
FP/0302-76-01 Advisory service in environmental planning and management—Kuwait	West Asia	Internal	3,680	3,680	April 1976 May 1976
FP/0302-76-02 Advisory service to the Government of Zaire	Africa	Internal	7,380	7,380	April 1976 May 1976
FP/0302-76-03 Pre-construction environmental study of the Tana River upper reservoir (Kenya)	Africa	Government of Kenya	250,000	200,000	May 1976 April 1977
FP/0302-76-04 Technical assistance to Sri Lanka for the establishment of the first Asian Rural Energy Demonstration Centre (REDC) at Pattiapola Village, utilizing the renewable sources of energy	Asia	Government of Sri Lanka	235,500	191,000	November 1976 November 1978
FP/0303—INFORMATION					
FP/0303-76-01 Initiation of publications programme	Global	Internal	188,100	188,100	March 1976
FP/0303-76-02 UNEP-sponsored journal	Global	Internal	720,000	720,000	January 1977 December 1979
FP/0303-76-03 IIED thematic media information programme (Earthscan)	Global	IIED (International Institute for Environment and Development)	844,500	570,000	January 1977 December 1979
FP/0402—TECHNOLOGY					
FP/0402-76-01 Papua New Guinea Workshop on Appropriate Technology	Asia and the Pacific	UNIDO	47,000	35,000	January 1976 November 1976
FP/0404—INTEGRATED APPROACH TO ENVIRONMENT AND DEVELOPMENT					
FP/0404-76-01 A programme of conceptual and methodological studies in the field of environment and development	Global	University of Sussex	71,000	60,500	August 1976 October 1977
FP/0405—ECODEVELOPMENT					
FP/0405-76-01 Ecodevelopment Seminar at Lorestan or Teheran, Iran	Asia and the Pacific	Centre for Endogenous Development Studies, Iran	25,200	19,500	December 1975 May 1976

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PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/0405-76-02 Studies and backstopping services for ecodevelopment	Global	<i>Ecole pratique des hautes études en sciences sociales, Paris</i>	521,000	235,500	October 1976 September 1978
FP/0406—SOCIO-ECONOMIC IMPACT OF ENVIRONMENTAL MEASURES AND/OR OF THEIR ABSENCE					
FP/0406-76-01 Research programme to study the role of perceptions, attitudes and values of people in relation to environmental and developmental goals (Phase II)	Global	UNRISD (UN Research Institute for Social Development)	63,000	57,350	January 1976 July 1976
FP/0406-76-02 Research programme to study the role of perceptions, attitudes and values of people in relation to environmental and develop- mental measures and programmes	Global	UNRISD	504,000	396,000	July 1976 July 1979
FP/0409—INDUSTRIAL LOCATION					
FP/0409-76-01 Ecological pre-audit study programme for an alumina plant, Jamaica	Global	Natural Resources Conservation Authority, Jamaica	309,900	200,000	March 1976 February 1977
FP/0503—REGIONAL ACTIVITIES					
FP/0503-76-01 Mediterranean programme activity (pollutants from land-based sources in the Mediterranean) MED.X Phase I (preparatory phase)	Europe and the Mediterranean	ECE/FAO/ IAEA/UNESCO/ UNIDO/WHO	76,000	40,000	April 1976 July 1976
Phase II (operational phase)			419,000	310,000	August 1976 November 1977
FP/0503-76-02 Caribbean environment programme (preparatory phase I)	Latin America and the Caribbean	Internal	62,200	62,200	April 1976 March 1977
FP/0503-76-04 Mediterranean programme activity (joint IOC/UNEP co-ordinated pilot project on problems of coastal trans- port of pollution—operational phase II) MED.XI	Europe and the Mediterranean	IOC	211,600	171,600	July 1976 December 1978
FP/0503-76-05 Mediterranean programme activity (joint WHO/UNEP co-ordinated pilot project on coastal water quality in the Mediterranean—operational phase) MED.VII	Europe and the Mediterranean	WHO	424,000	280,000	June 1976 November 1978

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PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/0503-76-06 Mediterranean programme activity (regional oil-combating centre for the Mediterranean) MED.XII	Europe and the Mediterranean	IMCO	657,500	537,500	September 1976 December 1978
FP/0503-76-07 Joint IOC/FAO/UNEP International Workshop on Marine Pollution in the Caribbean and Adjacent Regions	North America and the Caribbean	IOC/FAO	61,500	40,000	July 1976 March 1977
FP/0503-76-08 Oil pollution contingency planning for the Straits of Malacca and Singapore region—preparatory stage	Asia and the Pacific	IMCO	5,025	5,025	November 1976
FP/0503-76-09 Mediterranean programme activity (biogeochemical studies of selected pollutants in the open waters of the Mediterranean) MED.XIII	Europe and the Mediterranean	IAEA/IOC	350,000	160,000	October 1976 March 1978
FP/0503-76-10 Study of arrangements for co-operation in the event of pollution emergencies in the marine region shared by Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates	West Asia	IMCO	17,500	12,250	December 1976 January 1977
FP/0504—INTERNATIONAL AGREEMENTS					
FP/0504-76-01 Development of draft legal instruments for environmental protection of the Persian Gulf and the West African coast of the Atlantic (preparatory phase)	West Asia and Africa	Internal	75,000	75,000	September 1976 August 1977
FP/0700—ENERGY					
FP/0700-76-01 China study tour on energy and environment	Global	Internal	52,000	52,000	August 1976 November 1976
FP/1000—ENVIRONMENTAL MANAGEMENT					
FP/1000-76-01 Environmental protection and assessment measures of some multilateral development financing agencies: a review of programmes and their implications	Global	IIED	104,800	62,500	August 1976 July 1977

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PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/0202-73-06 State-of-knowledge report on tropical grazing land ecosystems (humid, subhumid, semi-arid and arid) as a basic tool for research design, training and integrated planning	Global	UNESCO	246,600	189,600	May 1974 March 1978
FP/1101—ARID LANDS AND GRAZING ECOSYSTEMS					
FP/1101-76-01 Support to the report "Can Desert Encroachment Be Stopped?" published by the Secretariat for International Ecology, Sweden (SIES) and the Swedish International Development Authority (SIDA)	Global	SIES	112,000	22,000	April 1976 December 1976
FP/1101-76-02 Geneva graduate study programme 1976 on desertification control for participants from developing countries	Global	United Nations Office of Public Information Geneva	50,000	40,000	January 1976 October 1976
FP/1101-76-03 Integrated ecological studies in the arid zone to promote rehabilitation and development Phase II: Establishment of co-ordinating unit and launching of initial field studies (Formerly FP/1101-75-05 (890) (Phase II))	Africa	UNESCO	522,300	375,000	October 1975 March 1977
FP/1101-76-04 Co-ordinating unit for desert encroachment control in the Democratic Republic of the Sudan (Phase I)	Africa	National Council for Research, Sudan	101,380	87,350	June 1976 October 1976
FP/1101-76-05 Ecological management of arid and semi-arid rangelands in Africa, the Near and Middle East (EMASAR) (Phase II)	Africa and West Asia	FAO	864,300	511,744	October 1976 April 1978

continued/

PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/1101-76-06 United Nations Conference on Desertification—feasibility studies: proposed transnational project management of the sandstone aquifer in North Africa and the Arabian Peninsula	Africa and Asia	Academy of Scientific Research and Technology, Cairo	48,000	46,000	April 1976 November 1976
FP/1101-76-07 United Nations Conference on Desertification—feasibility studies: transnational northern Sahara green belt	Africa	ALECSO	38,340	31,340	April 1976 December 1976
FP/1102—TROPICAL WOODLANDS AND FORESTS ECOSYSTEMS					
FP/1102-76-01 Pilot project in ecological training and management in tropical forest areas, as a basis for environmentally-sound development	Global	UNESCO	1,828,000	685,000	January 1977 March 1980
FP/1104—ENDANGERED SPECIES AND WILDLIFE					
FP/1104-76-01 Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora	Global	IUCN	202,250	202,250	April 1975 June 1977
FP/1106—SOILS					
FP/1106-76-01 Symposium on Environment Problems Resulting from Coal Industry Activities (Katowice, Poland)	Global	Government of the Polish People's Republic	68,954	40,000	18-22 October 1976
FP/1106-76-02 Soil resources of the earth, their evaluation, utilization and preservation, Phase 1: Project Design Workshop in Samarkand, Union of Soviet Socialist Republics	Global	IFIAS*/State Committee of the USSR Council of Ministers for Science and Technology and USSR Academy of Sciences	140,900	125,400	November 1975 November 1976
FP/1106-76-03 Research in mixed cropping and related studies on soil fertility and plant nutrition in tropical agriculture	Africa	Consultative Group on International Agricultural Research (CGIAR)	2,660,000	510,000	January 1976 December 1978
FP/1107—WATER					
FP/1107-76-01 Consultants for the task force/working group for United Nations water programmes (United Nations Water Conference)	Global	Internal	37,400	37,400	April 1976 December 1976

*International Federation of Institutes for Advanced Study.

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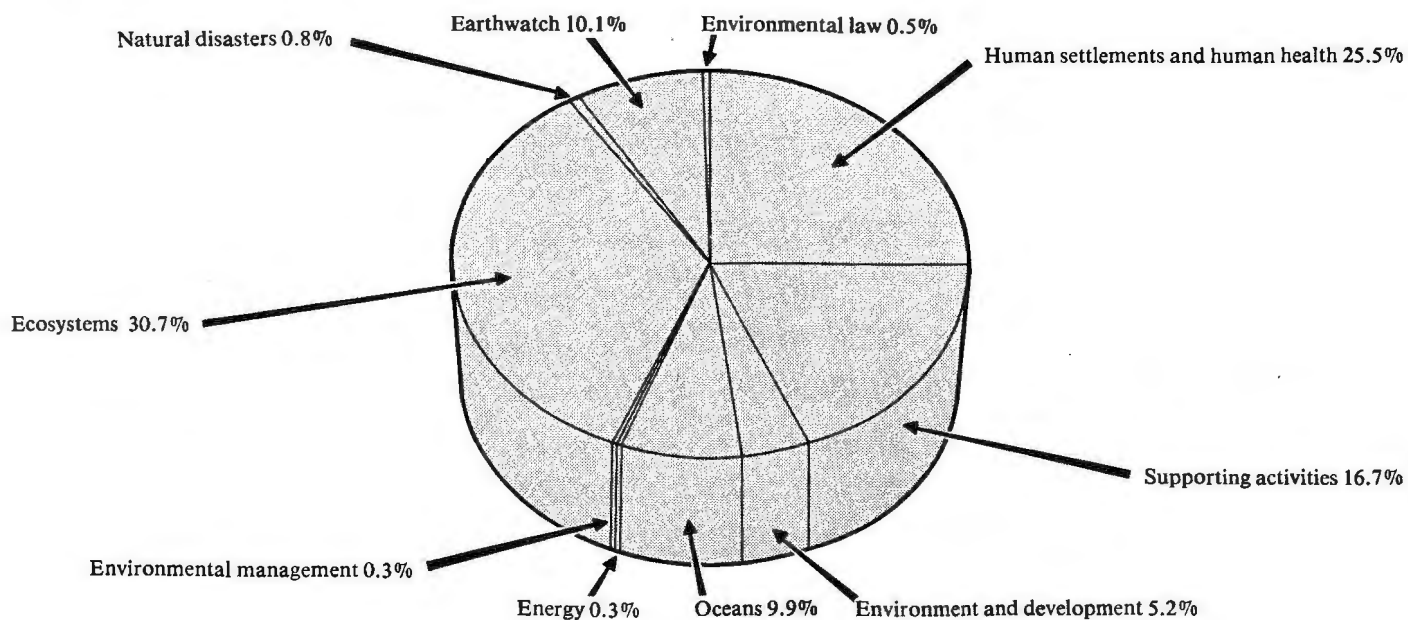
PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/1108—GENETIC RESOURCES					
FP/1108-76-01 Conservation of crop genetic resources	Global	International Board for Plant Genetic Resources (IBPGR)	2,416,000	200,000	March 1976 December 1977
FP/1108-76-02 Conservation of animal genetic resources	Global	FAO	366,610	296,610	October 1976 April 1979
FP/1108-76-03 Germ-plasm conservation and utilization in developing rice varieties minimizing pesticide and fertilizer requirements	Global	International Rice Research Institute (IRRI)/CGIAR	14,584,000	210,000	January 1976 December 1978
FP/1109—UNITED NATIONS CONFERENCE ON DESERTIFICATION					
FP/1109-76-01 Implementation of General Assembly resolution 3337(XXIX): International co-operation to combat desertification (Phase III)	Global	Internal	2,494,500*	2,023,500	January 1976 December 1977
FP/1200—NATURAL DISASTERS					
FP/1200-76-01 Level One overview: natural disasters	Global	UNDRO	32,000	28,000	March 1976 September 1976
FP/1200-76-02 Study of the state-of-the-art in disaster prevention and mitigation (Phase III)	Global	UNDRO	154,000	136,000	September 1976 December 1977
FP/1301—GLOBAL ENVIRONMENTAL MONITORING SYSTEM					
FP/1301-76-01 Monitoring of background pollution in the atmosphere—central CO ₂ laboratory	Global	WMO	169,100	156,100	January 1976 December 1977
FP/1301-76-02 Collecting and processing of glacier inventory data on a world-wide basis (P.A.1)—world glacier inventory	Global	UNESCO	136,000	82,000	February 1976 October 1977
FP/1301-76-03 Joint FAO/WHO food and animal feed contamination monitoring programme (Phase II)	Global	FAO/WHO	673,500	485,500	October 1976 September 1979
FP/1301-76-04 Feasibility study of the establishment of a baseline station on Mount Kenya	Africa	WMO	295,900	249,400	March 1976 July 1977

*Balance provided by UNDP, UNFPA and UNITAR.

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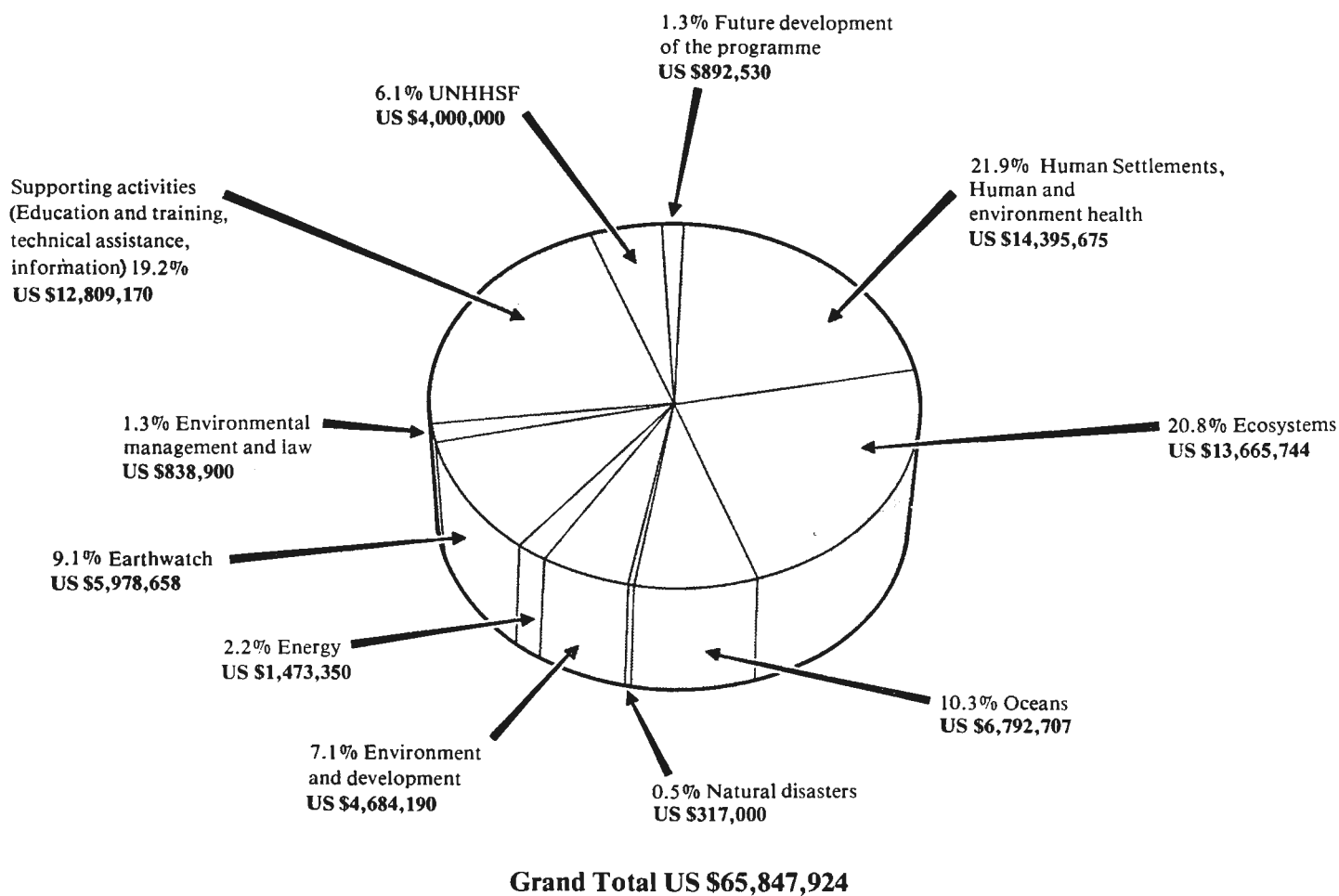
PROJECT TITLE	REGION	AGENCY	COST IN US\$		DURATION
			Total Cost	To UNEP	
FP/1301-76-05 Global water quality monitoring system	Global	WHO	1,075,000	640,000	October 1976 July 1979
FP/1301-76-06 Government expert group on health-related monitoring	Global	WHO	70,000	65,000	January 1977 April 1977
FP/1303—OUTER LIMITS					
FP/1303-76-01 Nitrogen, sulphur and phosphorous biogeochemical cycles	Global	Royal Swedish Academy of Sciences	87,500	47,500	December 1975 September 1976
FP/1303-76-02 Interdisciplinary approach to conceptualize social outer limits	Global	Internal	18,938	18,938	December 1975 February 1976
FP/1303-76-03 An analysis of human requirements	Global	Internal	60,000	60,000	September 1976 March 1977
FP/1303-76-04 Ozone Meeting	Global	Internal	116,000	116,000	September 1976 February 1977
FP/1303-76-05 Global ozone research and monitoring project (Phase I)	Global	WMO	70,000	50,000	January 1977 September 1977
FP/1400—ENVIRONMENTAL LAW					
FP/1400-76-01 Group of governmental and other experts on responsibility and liability for pollution and other environmental damage	Global	Internal	90,000	90,000	October 1976 April 1977

Percentage of 1976 approved projects



Grand Total US \$19,453,964

Distribution of projects in relation to the objectives of the Environment Programme 1973-1976



Institutional distribution of commitments incurred by projects approved in 1976*

	Commitments in \$US	
<i>Co-operating Agencies:</i>		
CHBP	10,500	0.1
ECA	48,500	0.2
ECE	310,000	1.6
ECLA	9,645	0.0
ECWA	19,000	0.1
ESCAP	140,000	0.7
FAO	1,662,904	8.5
IAEA	160,000	0.8
IMCO	604,275	3.1
OPI	40,000	0.2
UNDRO	150,000	0.8
United Nations/ESA	370,000	1.9
UNESCO	2,482,300	12.8
UNIDO	70,000	0.4
UNRISD	453,350	2.3
WHO	1,297,750	6.7
WMO	523,400	2.7
Subtotal	8,351,624	42.9

Supporting Organizations:

ALECSO	31,340	0.2
CEI	275,000	1.4
Centre for Endogenous Development Study, Iran	19,500	0.1
China	52,000	0.3
CICRED	235,500	1.2
Government of Sri Lanka	191,000	1.0
IBPGR	200,000	1.0
ICIPE—Nairobi	715,500	3.7
IDS	60,500	0.3
IFIAS	125,400	0.6
IIED	632,500	3.3
IITA	510,000	2.6
Indonesian Nat. Comm. on Environment	869,000	4.6
IRRI	210,000	1.1
IUCN	217,850	1.1
National Council for Research	87,350	0.5
National Housing Authority Philippines	689,000	3.5
Natural Resources Consv. Authority, Jamaica	200,000	1.0
RSP-ASRT—Government of Egypt	46,000	0.2

SCOPE	56,000	0.3
SIES	22,000	0.1
Swedish Academy of Sciences	47,000	0.2
Poland	68,700	0.3

Subtotal	5,561,140	28.6
Programme activity centres	1,289,000	6.6
Direct contracting	4,252,200	21.9
GRAND TOTAL	19,453,964	100.0

Institutional distribution of projects approved 1973-6

	Per cent	Co-operating agencies*	US\$
	0.0	CHBP	10,500
	0.2	ECA	165,500
	0.5	ECE	330,000
	0.7	ECLA	456,195
	0.0	ECWA	19,000
	0.2	ESCAP	140,000
	12.4	FAO	8,451,504
	0.8	IAEA	529,800
	0.9	IDEP	600,000
	0.7	ILO	468,400
	1.0	IMCO	664,275
	0.1	OPI	40,000
	2.4	UNCTAD	1,610,500
	0.6	UNDRO	415,000
	0.0	UNDP	20,000
	1.8	UNESA	1,209,190
	10.6	UNESCO	7,175,300
	0.9	UNESCO/IOC	628,250
	0.6	UNIDO	450,000
	5.9	UNHHSF	4,000,000
	4.4	UN/HABITAT	3,000,000
	0.7	UNRISD	467,350
	0.1	World Bank	55,800
	5.1	WHO	3,459,880
	1.9	WMO	1,319,010
Sub Total	52.5		35,685,454
Supporting Organizations	22.3		15,182,060
Direct Contracting	21.1		14,331,870
GRAND TOTAL	95.9		65,199,384

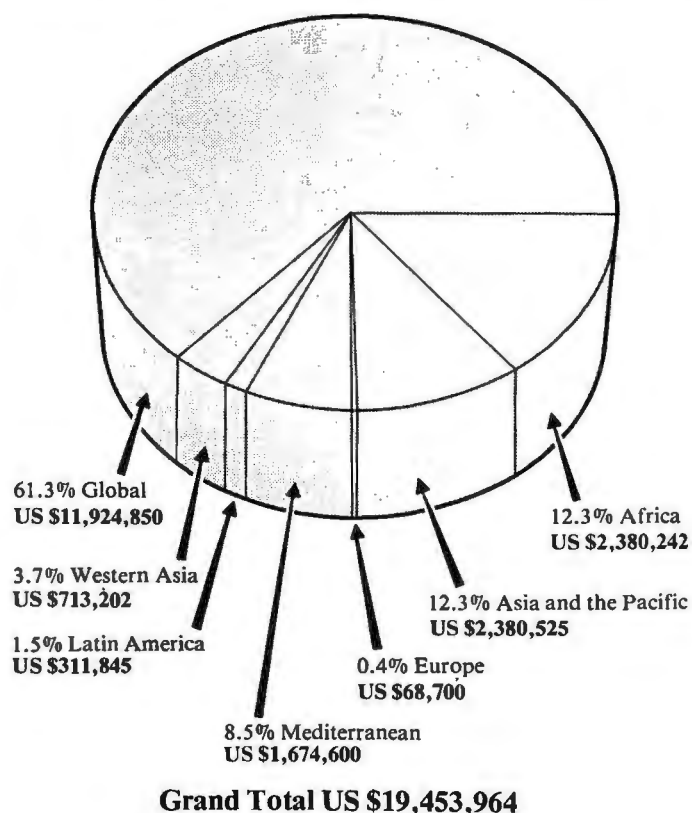
*From UNEP/GC/90 Table VI

*See list of abbreviations

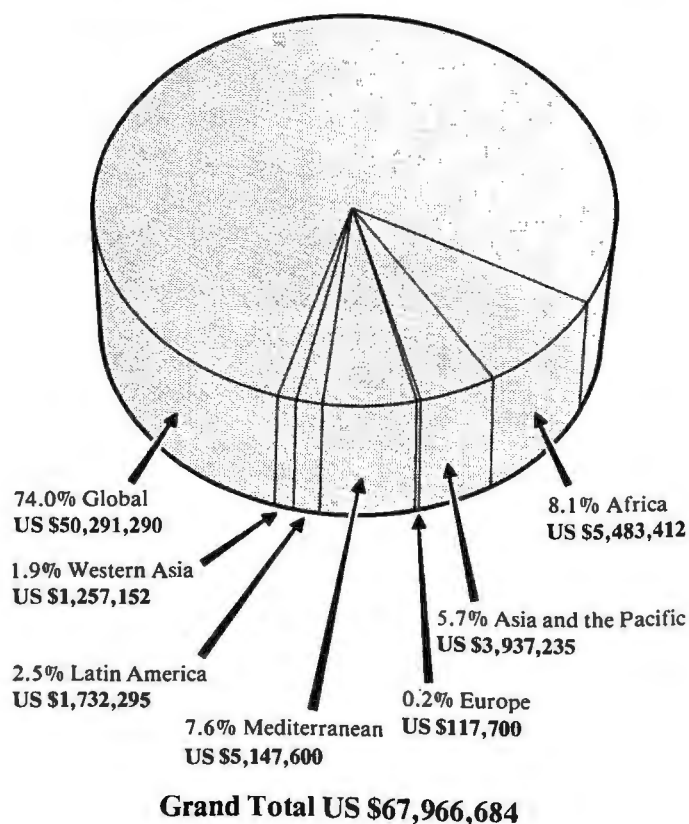
List of abbreviations

CHBP	Centre for Housing, Building and Planning
CICRED	Committee for International Coordination of National Research in Demography (UN)
ECA	Economic Commission for Africa
ECE	Economic Commission for Europe
ECLA	Economic Commission for Latin America
ECWA	Economic Commission for Western Asia
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
IAEA	International Atomic Energy Agency
IDEP	African Institute for Economic Development and Planning
IDS	Institute for Development Studies, University of Sussex
IITA	International Institute of Tropical Agriculture
ILO	International Labour Organisation
IMCO	Inter-Governmental Maritime Consultative Organization
OPI	Office of Public Information (United Nations)
RSP - ASRI	Government of Egypt
UNCTAD	United Nations Conference on Trade and Development
UNDRO	Office of the United Nations Disaster Relief Co-ordinator
UNDP	United Nations Development Programme
UNESA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO/IOC	UNESCO/Inter-Governmental Oceanographic Commission
UNIDO	United Nations Industrial Development Organization
UNHHSF	United Nations Habitat and Human Settlements Foundation
UN/HABITAT	United Nations Conference on Human Settlements
UNRISD	United Nations Research Institute for Social Development
WHO	World Health Organization
WMO	World Meteorological Organization

Geographical distribution of 1976 projects as of 31 December 1976



Geographical distribution of projects 1973-1976



ANNEXES

Annex A

Extract from "The Declaration of the United Nations Conference on the Human Environment"

"The United Nations Conference on the Human Environment,

Having met at Stockholm from 5 to 16 June 1972,

Having considered the need for a common outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment,
Proclaims that:

"Man is both creature and moulder of his environment, which gives him physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual growth. In the long and tortuous evolution of the human race on this planet a stage has been reached when, through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless ways and on an unprecedented scale. Both aspects of man's environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights, even the right to life itself.

"The protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world

"A point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consequences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well-being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes

"A growing class of environmental problems, because they are regional or global in extent or because they affect the common international realm, will require extensive co-operation among nations and action by international organizations in the common interest. The Conference calls upon Governments and peoples to exert common efforts for the preservation and improvement of the human environment, for the benefit of all the people and for their posterity."

Annex B

Organization of UNEP

1. The Governing Council

The Governing Council was established by United Nations General Assembly resolution 2997 (XXVII). It is composed of fifty-eight member States elected by the General Assembly for three-year terms, on the following basis:

- 16 seats: African States
- 13 seats: Asian States
- 6 seats: Eastern European States
- 10 seats: Latin American States
- 13 seats: Western European and other States

The assigned tasks of the Governing Council at its annual sessions are to:

- Promote international co-operation in environment and to recommend, as appropriate, policies to this end;
- Provide general policy guidance for the direction and co-ordination of environmental programmes within the United Nations system;
- Receive and review periodic reports of the UNEP Executive Director on implementation of environment programmes within the United Nations;
- Keep under review the world environmental situation;
- Promote the contribution of relevant scientific and professional institutions to the acquisition, assessment and exchange of environmental knowledge;
- Maintain under continuing review the impact of national and international environmental policies and measures on developing countries, costs, etc.;
- Review and approve, annually, ways in which resources of the Environment Fund are used.

Governing Council activities include reporting annually to the United Nations General Assembly through the Economic and Social Council, which stresses matters of co-ordination and the relationship of environmental policies and programmes within the United Nations to over-all economic and social policies and priorities.

The Governing Council also reviews UNEP progress, makes further proposals, takes decisions and approves changes, amendments, etc.

The Governing Council's objectives are two-fold:

That "quality of human life should constitute the central concern of the Programme and that therefore the enhancement of the total human habitat and the study of environmental problems having an immediate impact on

man should be given the highest priority in the over-all programme";*

That the fundamental task of the Programme should be the identification of major environmental problems as well as environmental management activities and supporting measures including:

- Technical assistance to Governments in promoting environmentally related measures;
- Aid to train personnel requiring specialized skills;
- All forms of aid, including financial, to strengthen national and regional institutions;
- Relevant materials to support public information and educational programmes on environment.

States Members of the Governing Council of UNEP

NB: Each holds a three-year term except for countries elected by the General Assembly in 1972. Member states can be re-elected.

STATE	1973	1974	1975	1976	1977
Argentina	*	*	*	*	*
Australia	*	*	*		
Austria	*	*			
Bangladesh					*
Belgium				*	*
Brazil	*	*	*	*	*
Burundi	*	*	*		
Bulgaria					*
Cameroon	*	*			
Canada	*	*	*	*	*
Central African Empire	*	*	*	*	*
Chad					*
Chile	*	*	*		
China	*	*	*	*	*
Colombia			*	*	*
Cyprus				*	*
Czechoslovakia	*	*	*	*	*
Egypt			*	*	*
Finland			*	*	*
France	*	*	*	*	*
Gabon	*	*	*	*	
German Dem. Rep.	*	*	*		
Germany, Fed. Rep. of	*	*	*	*	*
Ghana	*	*	*	*	*
Greece				*	*
Grenada				*	*
Guatemala	*	*	*	*	*
Hungary				*	*
Iceland	*	*			
India	*	*	*	*	*
Indonesia	*	*	*	*	*
Iran	*	*	*	*	*
Iraq	*	*	*	*	*
Italy	*	*	*	*	*
Ivory Coast		*	*	*	*
Jamaica	*	*	*	*	*
Japan	*	*	*	*	*
Jordan	*	*	*		
Kenya	*	*	*	*	*
Kuwait	*	*		*	*
Lebanon	*	*	*	*	
Liberia				*	*
Libya			*	*	*

Madagascar	*	*	*		
Malawi	*	*			
Malaysia			*	*	*
Mexico	*	*	*	*	*
Morocco	*	*	*	*	
Netherlands	*	*	*		
New Zealand				*	*
Nicaragua	*	*	*		
Nigeria	*	*	*		
Norway					*
Pakistan	*	*	*		
Panama	*	*	*		
Peru	*	*		*	*
Philippines	*	*	*	*	*
Poland	*	*	*	*	*
Romania	*	*	*	*	*
Rwanda				*	*
Senegal	*	*	*		*
Sierra Leone	*	*	*	*	
Somalia	*	*		*	*
Spain	*	*	*	*	*
Sri Lanka	*	*	*		
Sudan	*		*	*	*
Sweden	*	*	*	*	
Switzerland			*	*	*
Syrian Arab Republic	*	*	*	*	*
Thailand				*	*
Togo				*	*
Tunisia	*	*			
Turkey	*	*	*		
Uganda				*	*
USSR	*	*	*	*	*
UK	*	*	*	*	*
United Rep. of Tanzania	*	*	*		*
USA	*	*	*	*	*
Uruguay				*	*
Venezuela	*	*	*	*	*
Yugoslavia	*	*	*	*	*
Zaire			*	*	*

2. The Environment Co-ordination Board

The United Nations Environment Programme is charged with exercising a co-ordinating role throughout, and to some extent beyond, the United Nations system and to promote co-operation among national and international organizations and encouraging them to give due emphasis to the environment in their deliberations.

The Environment Co-ordination Board was established by General Assembly Resolution 2997 (XXVII), of December 1972, when the General Assembly decided that "... in order to provide for the most efficient co-ordination of United Nations environmental programmes, an Environment Co-ordination Board, under the chairmanship of the Executive Director of the United Nations Environment Programme, shall be established under the auspices and within the framework of the Administrative Committee on Co-ordination"; and that the Board will "... meet periodically for the purpose of ensuring co-operation and co-ordination among all bodies concerned in the implementation of environmental programmes and that it shall report annually to the Governing Council of the United Nations Environment Programme ..."

*UNEP pamphlet: *Your United Nations Environment Programme*.

The Environment Co-ordination Board is composed of heads of the following bodies within the United Nations system:

United Nations Disaster Relief Co-ordinator (UNDRO)
World Food Council (WFC)

United Nations Conference on Trade and Development (UNCTAD)

United Nations International Development Office (UNIDO)

United Nations Children's Fund (UNICEF)

United Nations Development Programme (UNDP)

World Food Programme (WFP)

United Nations High Commissioner for Refugees (UNHCR)

United Nations Institute for Training and Research (UNITAR)

United Nations University (UNU)

and heads of the following specialized agencies:

International Labour Organisation (ILO)

Food and Agriculture Organization of the United Nations (FAO)

United Nations Educational, Scientific and Cultural Organization (UNESCO)

World Health Organization (WHO)

International Bank for Reconstruction and Development (IBRD)

International Civil Aviation Organization (ICAO)

Universal Postal Union (UPU)

International Telecommunications Union (ITU)

World Meteorological Organization (WMO)

Inter-Governmental Maritime Consultative Organization (IMCO)

World Intellectual Properties Organization (WIPO)

and heads of other organizations:

International Atomic Energy Agency (IAEA)

Contracting Parties to the General Agreement on Tariffs and Trade (GATT)

The main purpose of the Board is to ensure a co-ordinated approach by the entire United Nations system on environmental issues. The Environment Co-ordination Board is a means whereby UNEP influences the programmes of the United Nations agencies and *vice versa*. To facilitate these processes, the Board has established groups or task forces to examine specific areas of the programme, such as Earthwatch, Water, Arid Lands.

3. The Secretariat

The secretariat of the United Nations Environment Programme serves as a focal point for environmental action and co-ordination within the United Nations system.

The Executive Director, who is nominated by the Secretary-General of the United Nations and elected to his post by the General Assembly, is responsible to the Governing Council for:

- Providing substantive support;
- Co-ordinating environmental programmes within the United Nations system, keeping their implementation under review and assessing their effectiveness;
- Advising intergovernmental bodies of the United Nations system on the formulation and implementation of environmental programmes;
- Securing the co-operation of and contributions from relevant specialized communities from all over the world;
- Providing, upon request, advisory services to promote international co-operation in environmental matters;
- Submitting, on his own initiative or upon request, proposals for medium- and long-range planning for United Nations environmental programmes;
- Bringing attention to any matter he believes needs consideration by the Governing Council;
- Administering the Environment Fund under authority and policy guidance of the Governing Council;
- Reporting on environmental matters;
- Performing functions entrusted to the Executive Director.

Annex C

List of decisions of the fourth Governing Council of UNEP

Thirty-five decisions were adopted on:

- 1 Programme policy and implementation (decision 47 (IV));
- 2 A review of the environmental situation and of activities relating to the environment programme, 48 (IV);
- 3 UNEP's catalytic role, 49 (IV);
- 4 Programme and Programme Fund programme activities, 50 (IV);
- 5 Human settlements and habitat, 51 (IV);
- 6 Chemicals and physical agents in the environment, 52 (IV);
- 7 Chemical substances and physical agents whose effects on the environment are unknown, 53 (IV);
- 8 African tropical and rain-forest ecosystem, 54 (IV);
- 9 Water resources, 55 (IV);
- 10 Protection of migratory birds, 56 (IV);
- 11 Environmental problems of specific industries, 57 (IV);
- 12 Oceans: regional agreements, 58 (IV);
- 13 Protection of whales, 59 (IV);
- 14 Renewable energy resources, 60 (IV);
- 15 Natural disasters, 61 (IV);
- 16 Regret at the disaster suffered by Guatemala, 62 (IV);
- 17 Earthwatch, 63 (IV);
- 18 Earthwatch: sulphur dioxide and other pollutants, 64 (IV);
- 19 Study of the ozone layer, 65 (IV);
- 20 Environmental law, 66 (IV);
- 21 Status of conventions, 67 (IV);
- 22 Training and technical assistance, 68 (IV);
- 23 Management of Fund programme activities, 69 (IV);
- 24 Allocation of resources for Fund programme activities, 70 (IV);

- 25 Habitat: United Nations Conference on Human Settlements, 71 (IV);
- 26 United Nations Habitat and Human Settlements Foundation, 72 (IV);
- 27 United Nations Conference on Desertification, 73 (IV);
- 28 Financial and budgetary matters, 74 (IV);
- 29 Matters relating to the implementation of the Fund programme, 75 (IV);
- 30 The Fund programme, 76 (IV);
- 31 Co-operation in the field of environment on shared natural resources, 77 (IV);
- 32 Institutional arrangements, 78 (IV);
- 33 Environment and development, 79 (IV);
- 34 Study of the problem of the material remnants of wars, particularly mines, and their effect on the environment, 80 (IV);
- 35 Relationships with non-governmental organizations, 81 (IV).

Annex D

Permanent Representatives accredited to the United Nations Environment Programme

(This section contains names of Permanent Representatives accredited as at 31 December 1976)

Name of Country	Representative
1 Argentina	H.E. Mr. D. Vicente G. Arnaud (Ambassador).
2 Australia	H.E. Mr. W.B.J. Handmer (High Commissioner).
3 Austria	H.E. Dr. Ernst Illsinger (Ambassador)
4 Belgium	H.E. Mr. Pieter O. Maddens (Ambassador)
5 Canada	H.E. Mr. G.A. Rau (High Commissioner)
6 Chile	H.E. Mr. Alberto Besa (Ambassador)
7 China	Mr. Chu Ke-ping
8 Colombia	H.E. Mr. G. Nannetti (Ambassador)
9 Cyprus	H.E. Mr. Filios A. Grammenopoulos (High Commissioner)
10 Denmark	H.E. Mr. H. Kühne (Ambassador)
11 Finland	Mr. G. Castrén (Chargé d'Affaires a.i.)
12 France	H.E. Mr. Olivier Deleau (Ambassador)
13 Germany, Fed. Rep. of	H.E. Dr. H. Heimsoeth (Ambassador)
14 Ghana	H.E. Mr. Asuchena Agyonbura Luguterah (High Commissioner)
15 Greece	H.E. Mr. Dimitri Manolatos (Ambassador)
16 Hungary	Dr. Tamás Tick (Chargé d'Affaires a.i.)

17 India	H.E. Air Chief Marshall Arjan Singh (High Commissioner)
18 Iran	Mr. M.A. Moezzi (Chargé d'Affaires a.i.)
19 Israel	H.E. Mr. Zeev Z. Dover (Interests Officer)
20 Italy	H.E. Mr. F. Meccafferri (Ambassador)
21 Japan	H.E. Mr. Masami Ota (Ambassador)
22 Morocco	H.E. Mr. Abdelaziz Jamaï (Ambassador)
23 Netherlands	H.E. Mr. R.H. Fein (Ambassador)
24 Norway	H.E. Mr. Rudolf Kristian Andresen (Ambassador)
25 Pakistan	H.E. Mr. Makhdumzada S. Hamid Raza Gilani (Ambassador)
26 Philippines	H.E. Dr. Mauro O. Baradi (Ambassador)
27 Poland	H.E. Mr. Z. Lesiak (Ambassador)
28 Rwanda	H.E. Mr. François Sindayigaya (Ambassador)
29 Somalia	H.E. Mr. Jaalle Awil Haji Ali (Ambassador)
30 Spain	H.E. Mr. Miguel Angel Velarde (Ambassador)
31 Sri Lanka	H.E. Mr. Wilfred Wijekulasuriya (High Commissioner)
32 Sudan	H.E. Mr. Hashim Osman Ahmed (Ambassador)
33 Sweden	H.E. Mr. Lennart Rydfors (Ambassador)
34 Switzerland	H.E. Mr. Richard Pestalozzi (Ambassador)
35 Turkey	H.E. Mr. Özer Fuat Tevs (Ambassador)
36 United Kingdom	H.E. Mr. S.J. Fingland (High Commissioner)
37 United States of America	Mr. Edward P. Noziglia (Counsellor)
38 USSR	H.E. Dr. B.P. Miroshnichenko (Ambassador)
39 Yugoslavia	H.E. Mr. Zika Radojlović (Ambassador)
40 Zaire	H.E. Mr. Ngoie Kampenga Kamakanga (Ambassador)

Annex E

UNEP and UNEP-supported Meetings, 1976

Government legal experts on the instruments for the protection of the Mediterranean, 7 - 9 Jan., Geneva.

Expert working group on Shared Natural Resources, 12 - 23 Jan., Nairobi.

Inter-governmental regional meeting on Environmental Studies in the Red Sea, 12 - 18 Jan., Jeddah.

Consultants and inter-agency meeting on Desert Map, 19 - 20 Jan., Geneva.

Expert group on Development of Project Activity Centre on Environmental Education and institutional network for Africa and Western Europe, 19 - 22 Jan., Nairobi.

Inter-agency meeting on Land-based Sources of Pollution, 20 Jan., Geneva.

Ad hoc inter-agency task force, on Desertification Conference, 21 - 24 Jan., Geneva.

Expert group on the Mediterranean Blue Plan Project, 22 - 23 Jan., Geneva.

Specialized focal points meeting on the Desertification Conference, 26 Jan., Nairobi.

Informal consultation with Governments, 28 - 30 Jan., Nairobi.

Expert group on Human Settlement Technology Programme with the Economic Commissions for Africa and for Western Asia, 2 - 6 Feb., Nairobi.

Plenipotentiary conference for the Protection of the Mediterranean, 2 - 16 Feb., Barcelona.

Marine preparatory expert meeting, 25 - 27 Feb., Geneva.

Expert group meeting on draft guide on Environmental Management and Protection, 1 - 3 March, Nairobi.

IRS workshop for French-speaking African and European countries, 1 - 5 March, Dakar.

Ecosystem Conservation Group meeting, 8 - 9 March, Morges, Switzerland.

Experts' consultation on the Mediterranean Blue Plan, 8 - 10 March, Geneva.

Desertification meeting on Plan of Action, 8 - 11 March, Geneva.

Second meeting of the senior consultants of the Desertification Conference, 12 - 14 March, Geneva.

Third International Conference on Culture Collection, 15 - 19 March, Bombay.

FAO/UNEP group of government experts on Environmental Monitoring of Soil and Vegetation cover, 15 - 19 March, Rome.

Joint UNEP/IPLAN meeting on Open Ocean Pollution Monitoring, 23 - 25 March, Geneva.

International Environment Prize, meeting of the advisory selection committee, 24 - 25 March, Nairobi.

Informal consultations with Governments, 29 March, Nairobi.

UNEP Governing Council IV, 30 March - 14 April, Nairobi.

Workshop on the East Asian Seas and the Malacca Straits, 2 - 13 April, Penang, Malaysia.

Environment Co-ordination Board focal points meeting, 15 April, Nairobi.

Ad hoc inter-agency task force on Desertification, 16 April, Nairobi.

Information meeting on IRS for industrial associations leaders organized by the Industry Seminar Centre, 5 May, Paris.

Expert group meeting on Eco-development, 5 - 8 May, Teheran.

First panel meeting on Ground-water Management. Feasibility Study, 10 - 13 May, Cairo.

Consultation of experts on the Mediterranean Blue Plan, 17 - 19 May, Paris.

Expert group meeting on Environmental Approach to Study Parasitic Zoonoses, 1 - 4 June, Nairobi.

Soil Resources of the Earth, their Utilization and Preservation, 11 - 21 June, Samarkand.

Inter-agency meeting on Regional Seas, 16 - 18 June, Paris.

IRS workshop for national focal points, 28 June - 2 July, Moscow.

Human Settlements Technology expert group meeting for the ECLA region, 12 - 16 July, Rio de Janeiro.

Panel of experts meeting on case studies of processes and causes of desertification, 22 - 24 July, Geneva.

Panel meeting on feasibility study on monitoring of desert processes in S.W. Asia, 2 - 5 Aug., Teheran.

IRS workshop for national focal points of Asia and the Pacific, 9 - 13 Aug., Sydney.

First panel meeting on Monitoring of Desert Processes in South-west Asia, 21 - 23 Aug., Teheran.

Informal preparatory committee meeting to plan for the Ozone Conference, 25 - 26 Aug., Geneva.

Expert consultation on Photosynthesis and Bio-productivity, 27 - 28 Aug., Rome.

Second panel meeting on Monitoring of Desert Processes in Latin America, 29 - 31 Aug., Peru.

Joint NOBEL-UNEP symposium on Nitrogen as a Fertilizer and as a Potentially Toxic Chemical, 30 Aug., - 3 Sept., Stockholm.

Expert group meeting to develop methodologies for assessing and choosing appropriate technologies, 30 Aug., - 3 Sept., Nairobi.

Meeting of component review authors and overview authors of documents for the Desertification Conference, 3 - 6 Sept., New York.

Joint programming meeting with WMO to identify areas of common interest in developing priority subject areas and functional tasks, 8 - 10 Sept., Geneva.

Regional seminar, environmental education for governmental decision-makers on the recommendations of the UNESCO-UNEP Belgrade Workshop, 11 - 16 Sept., Brazzaville.

Meeting of senior consultants on Desertification, 13 - 15 Sept., Geneva.

Joint programming meeting with UNDRP, 15 - 17 Sept., Geneva.

Fourth meeting of the inter-agency task force on Desertification, 17 - 18 Sept., Geneva.

Second session of the intergovernmental working group on Shared Natural Resources, 22 - 30 Sept., Geneva.

Meeting of the expert group on Livestock and Range Management in the Sahel (SOLAR), 23 Sept., Paris.

Motor vehicles seminar, third sector meeting organized by the UNEP Industry Programme, 4 - 6 Oct., Paris.

Joint programming meeting with FAO, 4 - 6 Oct., Rome.

Regional seminar on environmental education, UNEP-UNESCO, 5 - 8 Oct., St. Louis, Missouri.

Joint programming meeting with the World Food Programme and the World Food Council, 7 Oct., Rome.

Symposium on environmental problems resulting from coal industry activities, organized with the Economic Commission for Europe, 18 - 22 Oct., Katowice, Poland.

Environment Co-ordination Board, 20 - 21 Oct., New York.

Second meeting of the advisory group on the Desertification Action Plan, 25 - 29 Oct., New York.

Meeting on new means of financing environmental and other international programmes, 26 - 29 Oct., Bellagio, Italy.

Task force on legal instruments for regional seas — Persian Gulf, West African Coast, 1 - 5 Nov., Nairobi.

Joint programming meeting with the International Bank for Reconstruction and Development (IBRD), 2 - 4 Nov., Washington.

UNEP/UNESCO seminar on environmental education, 3 - 9 Nov., Bogota.

Joint programming meeting with the Inter-governmental Maritime Consultative Organization (IMCO), 8 - 9 Nov., Nairobi.

Joint programming meeting with the Economic Commission for Africa (ECA), 15 - 18 Nov., Addis Ababa.

Seminar for IRS focal points of the Latin American and Caribbean regions, 15 - 19 Nov., Bogota.

Level one advisory group meeting to review the State of the Environment 1977 Report, 15 - 19 Nov., Nairobi.

UNEP/UNESCO seminar on environmental education, 15 - 22 Nov., Bangkok.

UNEP/UNESCO seminar on environmental education, 21 - 25 Nov., Kuwait.

Second panel meeting on feasibility studies of Management of Livestock and Rangelands, 22 - 25 Nov., Ougadougou, Upper Volta.

Level One overview on Pest Management System, 22 - 23 Nov., Nairobi.

Level One overview on general development of Human Settlements, 24 - 25 Nov., Nairobi.

Level One overview on Natural Disasters, 29 - 30 Nov., Nairobi.
Panel meeting on feasibility study of Establishment of a Southern Sahel Green Belt, 29 Nov. - 2 Dec., Ougadougou.

Expert group of the International Register of Potentially Toxic Chemicals (IRPTC) scientific advisory committee, 30 Nov. - 3 Dec., Geneva.

Level One overview on Human and Environmental Health, 1 - 2 Dec., Nairobi.

Human Settlement Managers' training course, 1 - 14 Dec., Jaipur, India.

Joint UNEP/ESA regional expert consultation on the development and protection of the marine environment, 6 - 10 Dec., Kuwait.

Second panel meeting on feasibility study of Ground Water Management, 7 - 10 Dec., Qatar.

Advisory group on environment liability, 7 - 10 Dec., Nairobi.

Scientific group on monitoring health effects of environment agents, 7 - 13 Dec., Geneva.

Joint IOC/FAO/UNEP international workshop on marine pollution in the Caribbean and adjacent regions, 13 - 18 Dec., Port of Spain, Trinidad.

Industry Programme inter-governmental expert group meeting, 16 - 18 Dec., Paris.

Annex F

UNEP-supported Publications, 1975-6 Title and author

1. *Guidelines for Disaster Prevention* (3 volumes), UNDRO, Geneva, 1976. (E,F,S)¹
2. *Application of Building Climatology to the Problems of Housing and Building for Human Settlements*, J.K. Page. WMO, Geneva, 1976. (E)
3. *Urban Climatology and its Relevance to Urban Design*, T.J. Chandler. WMO, Geneva, 1976. (E)
4. Review of Programmes, 10th Anniversary 1966-76, CIMMYT², 1976, Mexico. (E,S)
5. "The Use of Ecological Guidelines for Development in the American Humid Tropics". IUCN³ Publications Series No. 31. Switzerland, 1975, 1976. (E,S)
6. "An Environmental and Economic Study of the Consequences of Pesticide Use in Central American Cotton Production", Final Report, Phase I, ICAITI⁴ Guatemala, 1976. (E,S)
7. The Use of Ecological Guidelines for Development in Tropical Forest Areas of South East Asia", IUCN Publications New Series No. 32, 1975. (E)
8. "Plans for Pilot Project on the Reclamation of Waste Waters in Developing Countries". Iran, 1975. (E)
9. *Losing Ground*, Erik Eckholm, (Environmental stress and world food prospects.) Worldwatch Institute/UNEP, New York, 1976. (E,F)
10. "Methods of Sampling and Analysis of Contaminants in Food". Report of a joint FAO/WHO Expert Consultation, 1976. (E,F)
11. *Tropical Rainforest Use and Preservation: a Study of Problems and Practices in Venezuela*, Lawrence Hamilton, Ph.D. A Sierra Club special publication, 1976. (E)
12. *African Environment* (monthly). 1976 issues. (E,F)

13. *World Environment Report*, 1975, 1976 issues (fortnightly). CIEI⁵. (E)
14. "The Two Faces of Malnutrition", Erik Eckholm. Worldwatch paper No. 9, 1976. (E)
15. *The Home of Man*, Lady Barbara Jackson (Ward), 1976. (E)
16. "The Economy and Utilization of Timber in the Tropics through Wood Preservation". Papua, New Guinea, July 1975. (E)
17. *Environmental Education. A Sourcebook*. ALECSO⁶/UNEP, 1976. (Arabic with English summary)
18. *Journal of Engineering Education in South-East Asia*. Vol. 6 — seventh issue, April 1976. (Special issue on environmental engineering education). (E)
19. *Science for Better Environment*. Proceedings of the International Congress on the Human Environment. Kyoto, 1975. (E)
20. *Ecotécnicas para el trópico húmedo*, Claudio Romanini, Mexico, 1976. (S)
21. "Motor Vehicle Industry and the Environment. Seminar papers and documents". UNESCO, Paris, 1976. (E,F)
22. "Reports and Studies No. 5." (Principles for developing coastal water quality criteria). IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN, 1976. (E,F,S and Russian)
23. *The Health of the Oceans*, Edward D. Goldberg. UNESCO, Paris, 1976. (E)
24. *Determination of the Atmospheric Contribution of Petroleum Hydrocarbons to the Oceans*, William D. Garrett. WMO, 1976. (E)
25. "The Mediterranean Basin. Proposal for a Programme of Studies and Action", Blue Plan. January 1976. (E)
26. "Health: the Family Planning Factor", Erik Eckholm.
27. "Guide to Operational Procedures for the IGOS Pilot Project on Marine Pollution (petroleum) monitoring". Manuals and guides No. 7 UNESCO/WMO/IOC (Intergovernmental Oceanographic Commission), June 1976. (E,F,S and Russian)
28. "The Methodology of Conservation of Forest Genetic Resources". A Pilot Study, 1975.
29. "Conservation of Animal Genetic Resources". A Pilot Study, 1975. (E,F)
30. "Selected Methods of Measuring Air Pollutants". WHO, 1976 (publication 24). (E,F)
31. *Ecological Guidelines for the Use of Natural Resources in the Middle East and South West Asia*. IUCN/UNEP, 1976. (E)
32. *Can Desert Encroachment be Stopped? A Study with emphasis on Africa*. Stockholm: Swedish Natural Science Research Council, 1976. (E)
33. *An annotated bibliography on the Pinnipedia*. International Council for the Exploration of the Sea. Denmark, 1976. (E)
34. *Research Highlights for 1975*. International Rice Research Institute, Philippines, 1976. (E)

¹E = English, F = French, S = Spanish

²International Maize and Wheat Improvement Centre (Centro Internacional de Mejoramiento de Maíz y del Trigo)

³International Union for the Conservation of Nature and Natural Resources

⁴Instituto Centroamericano de Investigación y Tecnología Industrial

⁵Centre for International Environmental Information

⁶(ALECSO) Arab League Educational, Cultural and Scientific Organization

35. Annual Report 1975. CIAT⁷, Columbia, S.Am. 1976. (E)
36. "An Evaluation of Climate and Water Resources for Development of Agriculture in the Sudano-Sahelian Zone of West Africa". WMO. No. 459. Special Environmental Report No. 9, 1976. (E)
37. *Eutrosym '76*, Proceedings of the International Symposium on Eutrophication and Rehabilitation of Surface Waters. Vol. I-V. German Democratic Republic, 1976. (E,F, German, Russian)
38. GEMS: "Air Quality in Selected Urban Areas, 1973-1974". WHO, Offset Publication No. 30, 1976. (E)
39. *The Quantitative Evaluation of the Risk of Disaster from Tropical Cyclones*. WMO, 1976.
40. *Disaster Prevention and Mitigation*:
 Vol. I — volcanological aspects, 1976
 Vol. II — hydrological aspects, 1976
 Vol. V — land use aspects, 1976
 UNDRO, Geneva. (E,F,S)
41. "Connect", a UNESCO-UNEP Environmental Education Newsletter. UNESCO, Paris. (E,F,S)
42. "Energy Policy for the Rural Third World", IIED⁸. September 1976. (E)
43. *Ambio*, Royal Swedish Academy of Sciences magazine. Vol. IV No. 4, 1975. (E)

⁷Centro Internacional de Agricultura Tropical

⁸International Institute for Environment and Development

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