

Study Week on

A MODERN APPROACH  
TO THE PROTECTION  
OF THE ENVIRONMENT

November 2-7, 1987

CONCLUSIONS



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## FOREWORD

*The protection of the environment represents today a priority in both research and action to avoid the disruption of the ecosystems forming the biosphere, which may lead to an unlivable planet.*

*Concern about the environment was clearly expressed by Pope John Paul II in his allocution to the Academy on October 28, 1986:*

*"The harmonious relationship between man and nature is a fundamental element of civilisation, and it is easy to grasp all the contribution that science can bring to this field of ecology, in the form of defence against violent alterations of the environment and of growth in the quality of life through the humanisation of nature".*

*The Pontifical Academy of Sciences, which since 1970 had made a choice of studying the scientific problems concerning ecology, following the suggestion of the Pope organized immediately a Study Week on A Modern Approach to the Protection of the Environment, which took place on November 2-7, 1987.*

*Among the multifaceted topics and aspects of ecology, it was decided that on the basis of the data so far obtained through research in the last twenty years and the analysis of the state of the biosphere, the object of the meeting should be that of suggesting solutions in order to protect our environment, that is, how to go into action.*

*I am very grateful to all the participants who accepted to be with us in this task, bringing the contribution of their knowledge and their papers but also of their enthusiasm.*

*Anticipating the publication of the papers and discussions in the Scripta Varia, the Academy presents here the conclusions arrived at by the participants in the Study Week, which focus on some of the most important guidelines for action for the protection of the environment.*

CARLOS CHAGAS

*President of the Pontifical Academy of Sciences*

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## INTRODUCTORY REMARKS

G.B. MARINI-BETTÒLO

I thank you for having traveled long distances to come here, to the Casina Pio IV in the Vatican, specifically in this year of 1987, the year that has been dedicated by the United Nations to the environment.

Quite a number of meetings on the subject of the environment have been held in the world these past months. The present one, however, taking place, as it does, on the Vatican Hill — and, if I may add, in the very shadow of St. Peter's dome — has a unique character: the results of our studies and discussions of the contemporary environmental crisis, which affects so profoundly the dynamic equilibrium of man's existence in the biosphere, will be presented to the Holy See for its consideration.

The mismanagement of the environment on the part of humankind has caused, as we all very well know, deep modifications in the biogeochemical equilibria which sustain life on earth. Indeed, these modifications may irreversibly affect the natural, dynamic equilibria which make our present way of life possible. Allow me to cite some of these imbalances: global change of climate, depletion of the ozone layer in the stratosphere with the concomitant danger of increased ultraviolet radiation, desertification and deforestation with consequent changes in the earth's water cycles, pollution of the seas, and so on. Furthermore, the continuous exploitation of natural resources, both renewable and non-renewable, for the purpose of satisfying not only the needs of an ever-growing world population but also those of wasteful consumerism will render ever more rare the raw materials that are extracted from the earth's crust, such as petroleum and heavy metals, and will destroy, with severe damage to the integrity of « nature », important species of flora and fauna.

These absurd policies — « nature » being the expression of the biogeosphere which constitutes the framework for and the means of humankind's survival — represent a great danger: they are rendering our planet as unlivable as the moon. Not only persons and groups, but even certain governments, are motivated by shortsightedness and selfishness which permit them to exploit and dominate our planet without any concern for the future, without any respect for the future of the generations which will follow us.

The warnings of scientists, issued a few years ago, reached countless people, professionals in mass media and leaders of governments responsible for the management of the earth. As a result, a change in attitudes toward the environment has been noticed. More and more people are aware that we live on a finite planet with limited resources which were accumulated during millions of years and which cannot be destroyed or dispersed at the present, rapid rate without danger to life as we know it. This does not mean that the reversal of tendency is complete, but it does imply that some steps toward improvement have been taken. Still other incentives will have to be found to motivate our efforts to correct the present degradation of natural and humanly modified ecosystems.

Already in 1970, that is, before the United Nations Stockholm declaration on the human environment, and, more recently, in 1983, the Pontifical Academy of Sciences considered the global effects of pollution on the atmosphere. The purpose of the present Study Week is to discuss how and to what specific areas ethical principles may be applied to direct our actions and our use of scientific and technical means in protecting the environment.

A number of analyses of the present state of degradation of the dynamic equilibria which sustain the environment have been made, supplying us with an immense quantity of data which will enable us to formulate a fairly good, even if not complete, picture of the present situation and will permit us to extrapolate various future scenarios. The ascertainment of these data, however, cannot constitute the goal of our work, rather it must become the basis for our future action toward better management of the environment and the biogeosphere.

If a constructive, global, strategy toward the protection of the environment is to be socially compatible and even economically sound, then it must be developed through an interdisciplinary approach which will avoid the

impossible and impractical solutions which might be suggested by theoretical or unilateral considerations. Thus, such a strategy must be sustained primarily by the effort to attain the common good and not by exclusive or vested commercial interests. We cannot pretend, on the one hand, that the earth's 5 billion people return to a silvopastoral economy, which ecologically might be sound but insufficient to sustain the population, and, on the other, that the earth's surface be transformed into great factories and vast, industrially run, agricultural areas, which would modify the equilibria of natural ecosystems, wasting and diluting precious raw materials. Furthermore, we must remember that particular problems make up the global view. For example, a new approach is necessary to environmental protection in the South, mainly in the tropics. In the recent past, measures to prevent environmental decay were erroneously considered a limitation to development, whereas, today, they may indeed be one of the main contributors to wealth.

Before the natural equilibrium, which includes atmospheric and climatic phenomena, is disrupted irreversibly, we must propose feasible solutions which will be acceptable to all the peoples of the world and will enable them to face the challenge of the future. Science and the means of technology should offer solutions which are consonant with the continuous growth of the human populations. But science, technology and the economy, unless they are supported by a new way of thinking about the environment based on ethical principles, will not be capable by themselves to save the future of the biosphere. Consequently, an interdisciplinary and systematic approach is necessary in order to overcome reductionism in proposing solutions.

You, the most distinguished scholars in the field, are gathered here to offer your expert analyses, advice, and suggestions. Our task is not easy. At times it will require not only a modification but even the eradication of ideas and forms of behavior that have conditioned mankind from its very beginnings. Ecological, economic, social and cultural research must be accompanied by the development of a new mentality, one that will respect "nature" and the environment and will inculcate a reasonable and moderate use of natural resources. Such an attitude toward "nature" should be the object of education at every level, not only in schools but in temples, mosques and churches of every religion.

We should recall here the example and the teachings of Saint Francis of Assisi, the patron of all those who are concerned for the ecological health of the biosphere. Already in the thirteenth century, he anticipated

the attitude which should motivate every human being today. Convinced that, by reason of their origin and destiny, all living and inanimate creatures are dependent upon each other, he recognized a form of cooperative partnership among them and called them his brothers and sisters — *brother sun, sister moon, brother air, sister water, and sister earth, our mother*. If only some of the Saint's enthusiasm were to motivate our attitudes, it would enable us to solve our immense environmental problems, and, finally, to face the future with serenity and hope.

## CONCLUSIONS AND FINAL CONSIDERATIONS

The world and humanity are at risk; alarming signals of this danger reach us from all directions. But an all-embracing institutional structure capable of dealing with the crisis — to ensure the correct identification of its causes and to implement effective remedies — does not yet exist. Difficulties inherent in the very analysis of the risk are further exacerbated by its complexity and by the widespread uncertainty about its precise nature.

Environmental problems pervade all facets of human activity and should be treated as an integral part of all national and international policies. Indeed, this Study Week was called to address what is, in a certain but very real sense, one of the all-encompassing and, therefore, ultimate problems that humankind must face and solve.

The purpose of our meeting was to examine damage to the natural environment caused primarily by the undisciplined activities of humans. It was considered that, to face the needs of an increasing population, the limited resources of the earth and the management of the environment require rational and accurate planning, based not only on demographic and economic factors, but also on ethical, cultural and social considerations. Thus, while it is generally assumed that poverty, population growth and mismanagement of the environment are not independent of each other in exerting large but unequal pressures on available resources, there are no simple solutions to the perceived interdependence of these factors as causative of the risk.

In order to formulate suggestions and proposals for guidelines to ensure the protection of the environment, we considered separately those problems which give rise to worldwide or global changes and those which, being related to particular geographic regions or to meteorological-climatic-processes, modify the single ecosystems.

The first group of problems may in great part be attributed to modifications in the atmosphere caused by anthropogenic activities and

the subsequent changes in climate due to increasing concentrations of CO<sub>2</sub>, trace gases, particulates, depletion of the stratospheric ozone layer, and to acid depositions and photochemical oxidants. These problems were examined by the Academy in 1983 (cf. Scripta Varia, 56, *Chemical Events in the Atmosphere and Their Impact on the Environment*, Pontificia Academia Scientiarum, 1985). Aware of the conclusions of that Study Week, we take into consideration here only the most recent advances in the field.

We examined other aspects of the protection and sustainable uses of the environment and of the biosphere, principally the biological, such as deforestation, mountain ecosystem, desertification, etc., as well as some social dimensions of human development, for example, poverty.

Finally, some of the aspects covered during our Study Week included the management of the global commons such as tropical and temperate forests, mountain environments and climatic change, together with regional issues such as the pollution of soil, water and vegetation ecosystem, and of international rivers and seas. Also considered were institutional strengths and weaknesses, and ethical issues involved in the conflict between perceptions on the part of societies and on the part of individual human beings. In reviewing these problems, the breakdown of incentives for the management of environmental resources was examined and possible remedies were proposed.

These problems were the object of our considerations and discussions. The proposed solutions take into account not only theories of profit but also ethical principles. We believe that adequate solutions to the problems of the environment can be found if, beyond economic considerations, principles of ethics are applied to development and progress.

We recognized the dangerous tendency for institutions and the scientific community to oversimplify environmental problems and, consequently, to propose simplistic or self-serving solutions. It is necessary to take into account all the dimensions — natural and cultural, economic and political — of a complex problem, if any realistic formulation of a commitment to long-term solutions is to be achieved. This approach will require a carefully conceived structure for global and regional monitoring, linked to the decision-making process. In particular, simulation models and knowledge-based systems are proving to be exceptionally efficient in making scientific expertise available to resource managers, administrators and politicians. We also identified the need for immediate action, based on the best available information at any given time, with allowances for

foreseeable short-term adjustments, as a response to the ever-growing clarity with which an environmental problem must be addressed. This kind of intervention ought to ensure flexibility and the utilization of newly acquired knowledge. Furthermore, it should apply to many of the major global problems as perceived today, problems which include climate change, depletion of the ozone layer, the degradation of the life-support base, and the threat of nuclear destruction.

## 1. REGIONAL ISSUES

Today, many countries experience great difficulty in solving environmental problems on their own. This difficulty is partly due to the transboundary nature of many problems, such as acid rain, the mismanagement of international river systems, the pollution of the seas, etc.

Individual countries have little or no control over contaminants that are, or will be, transferred to their territories through the atmosphere or international waters. Nevertheless, their forests, surface and ground waters, soil, and even the health of their populations are thus exposed to grave risks. Furthermore, countries may not have the incentives to act in a manner conversant with the general good of an entire region. Therefore, it is essential to create close regional cooperation in all areas of protection and management of the environment, including the buildup of an appropriate, regional, institutional framework.

We are greatly encouraged by success in pollution control achieved through certain regional arrangements, such as the Mediterranean Action Plan. Established within the framework of the political realities of the countries bordering on the Mediterranean Basin and funded by them, the Action Plan demonstrates the feasibility of action based on sound scientific research and responds to the needs of the countries, as defined by their highest political authorities.

*We therefore recommend the use of bilateral and multilateral arrangements, supported with adequate funding, so that effective solutions to transboundary pollution problems may be found and implemented.*

## 2. GLOBAL ASPECTS

Beyond the problems posed by the rising concentrations of CO<sub>2</sub> and atmospheric particulates and by the depletion of the ozone layer, it is

the very pollution of the environment by chemical substances that causes serious concern. Chemicals present a risk to living organisms and may create global, as well as regional and local, problems such as climate change.

Risk assessment entails the study of sources, pathway and chemical transformations in the various compartments of the environment. Exposure of living targets and of entire ecosystems must be estimated, including the effects on human health.

Once a risk is characterized, it should be managed. Appropriate measures may aim at emission reduction through setting of standards for effluent streams, development of "clean technologies", testing of new chemicals prior to marketing, restriction of exports of hazardous chemicals, waste minimization and waste detoxification, prevention and mitigation of chemical accidents, etc.

The problem is manageable if appropriate action is taken.

*We therefore recommend that the impact of chemicals introduced into the environment be kept track of and evaluated, and, through international agreements, trade in potentially toxic chemicals, as well as in hazardous waste products, be strictly controlled.*

### 3. BIOLOGICAL DIVERSITY

The unsustainable and destructive use of the land and other common resources is driving a high proportion of the world's species of plants, animals and microorganisms into extinction. Since human societies are based almost entirely on their ability to utilize other species for their own benefit, the loss during the next 15 to 20 years of perhaps a million or more species — possibly amounting to a quarter of the earth's biological diversity — is extremely serious.

Since most of these species will be lost in the tropics, this represents a great loss from economic, aesthetic, moral and scientific points of view, and will greatly limit future human potential.

We believe that immediate steps must be taken to catalogue the remaining biological diversity to understand its properties, and to protect as many kinds of organisms as possible, but especially those of ascertained or potential importance to human beings. Moreover, since species function and survive in specific habitats, the preservation of biological diversity must be conceived as part of a larger effort to preserve those specific

habitats. Effective preservation, however, can be implemented successfully only if other legitimate needs of human beings are also safeguarded.

*We therefore recommend the conservation of all species and their respective habitats as an urgent issue for the international community, and also the provision by that same community of the financial resources necessary to undertake such a task.*

#### 4. MOUNTAIN ENVIRONMENTS

Mountain lands can be characterized, both physically and culturally, as one of the most complex divisions of the world's land surface. For example, research into erosion of mountain lands, although conducted over several decades, has failed to produce an acceptable body of process theory because of the extreme variability both in time and space of the dynamic processes occurring in those lands. Despite this, and despite the even greater uncertainties introduced into research by cultural complexities, conservationists and development programmers persist in working with generalizations that are then used as bases for simplistic solutions to inadequately understood problems. Such is the case of the Himalaya. Thus, networks which would coordinate interdisciplinary research into mountain lands and the application of solutions to their complex environmental problems should be encouraged.

*We therefore recommend the establishment of an effective international research network on environmental problems related to mountains in order to ensure a more realistic approach to the management of mountain resources. Such a network is conceived as one of a series; others should be set up whenever the necessity is demonstrated.*

#### 5. POVERTY

According to the World Bank, some 1.2 billion of the world's 5 billion people live in absolute poverty. Of these, from 300 to 400 million receive less than 80% of the UN-recommended minimum number of calories. Of the approximately 55 million deaths in the world every year, at least one-third — 90% of them being children under four years of age — result from starvation or from conditions associated with it. International assistance programs rarely address the plight of these people directly, and national policies often favor the more affluent urban dwellers over the rural poor. It will be impossible, however, to implement stable

land management systems unless a far greater proportion of poor people enjoy the benefits of *their own* societies and, through them, of the global economy. Greater equity in the distribution of resources and the development of appropriate technologies in forestry and agriculture, and greater equity in the social and economic conditions which make possible the adoption by poor rural people of suitable farming and forestry techniques, are essential if the global ecosystem is to be managed in a sustainable way.

*We therefore recommend that the satisfaction of the needs of the rural poor, as a measure of critical importance in the sustainable management of the global ecosystem, receive priority attention in development schemes.*

#### 6. CULTURAL DIVERSITY AND THE PRESERVATION OF TRADITIONAL KNOWLEDGE

We recognize the importance of preserving cultural diversity, not only because of our moral obligation to do so but also because of the accumulated knowledge that is transmitted through their particular forms of traditional inheritance. A recurring theme of our discussions was the importance of the careful study of traditional systems of agriculture and agroforestry, and of local adaptations of indigenous species to particular habitats. Such systems and practices merit comprehensive scientific study and understanding so that they can be rendered more systematic, upgraded and incorporated into modern agricultural procedures. Indeed, a critical interest in the accumulated knowledge base of how tropical societies have met the challenge of living in difficult environments can give an early and effective point of departure for the development of a productive and ecologically sound life-support system. A similar interest in the knowledge base of rural communities can be particularly important to their productivity and ecosystems.

*We therefore recommend the development of guidelines for the incorporation of the knowledge derived from culturally diverse societies into project planning and implementation, monitoring and evaluation.*

#### 7. ETHICAL AND EDUCATIONAL CONSIDERATIONS

Appropriate action for the use of our biological and cultural resources, for the preservation of the dignity of human life and for the advancement

of living standards throughout the world requires a much fuller attention to the entire educational process. It demands more effective dissemination of knowledge, both traditional and recent, at every level of teaching and of communicating information. Such dissemination of knowledge is necessary to enable specific sectors of society and individuals themselves to participate more effectively in the decision-making process involved in the attainment of sustainable and meaningful forms of living on our planet.

Religious concern for the protection of the environment, as evidenced in Papal documents and addresses and in study programs organized by the World Council of Churches, makes us bold to suggest that ecumenical, interreligious and interdisciplinary dialogue be encouraged and undertaken concerning the following: environmental problems, human life and the conservation of species, humankind's ethical and religious position in the biosphere, progress, and the purpose of scientific research and of its technological applications. Such dialogue could render an incalculable service to a modern approach to the protection of the environment.

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We have in our conclusions stressed only a few aspects of the action required for the current management of the environment, aspects which in the past received less attention and emphasis but which today, in our judgement, are of great importance to a new approach to the complex problem of environmental protection.

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