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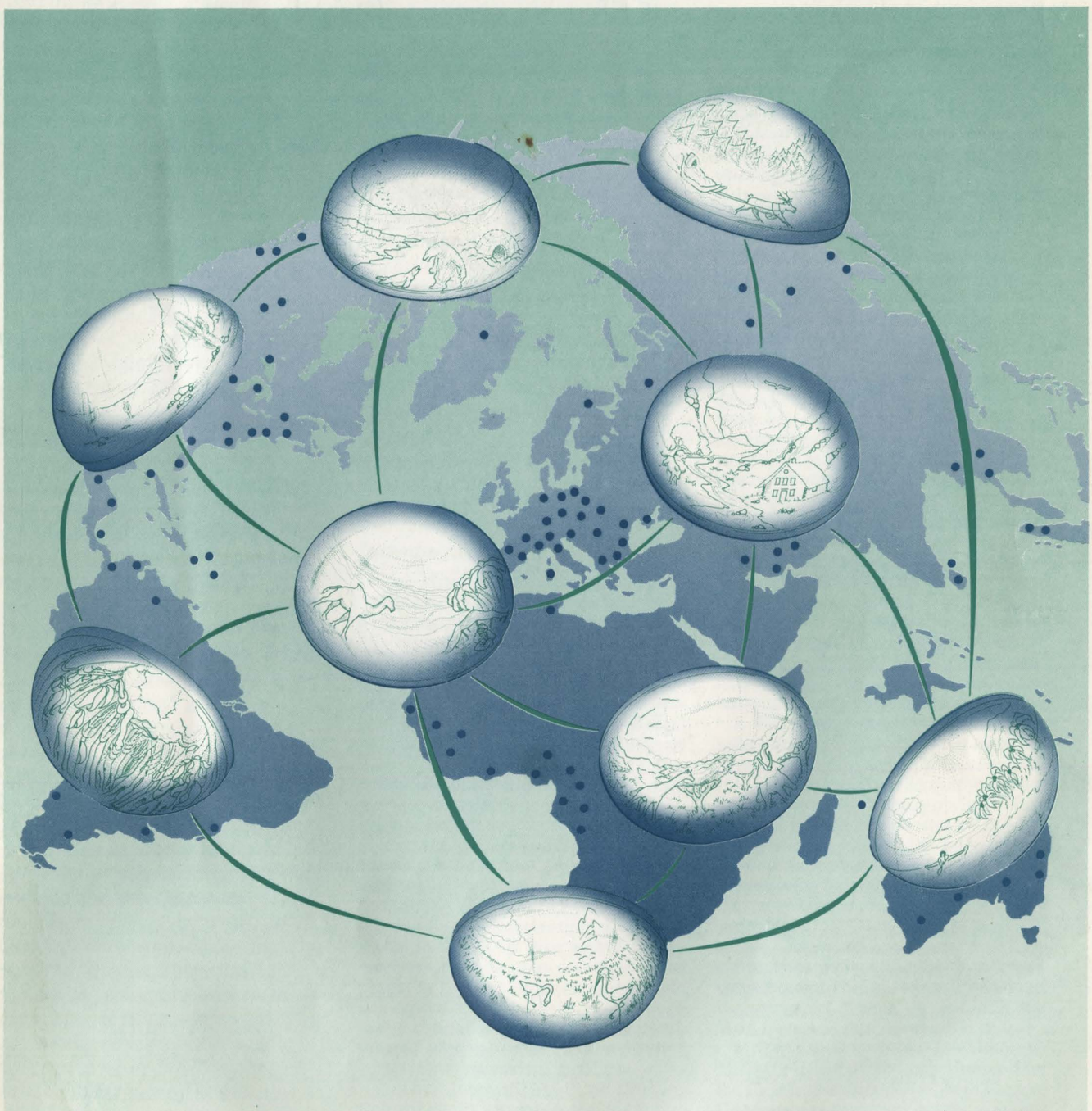


MAB

Action plan for biosphere reserves

Action Plan for Biosphere Reserves

On the basis of the results of the First International Biosphere Reserve Congress, jointly convened in Minsk in 1983 by Unesco and UNEP in co-operation with FAO and IUCN, at the invitation of the USSR, and of consultations with conservation specialists and scientists which have since taken place, an Action Plan for Biosphere Reserves was adopted by the International Co-ordinating Council of the Programme on Man and the Biosphere at its eighth session (Paris, 3-8 December 1984) and is presented in this document as a programme framework. This framework identifies a range of actions for consideration by governments and concerned international organizations in developing the multiple functions of biosphere reserves within the overall context of the MAB Programme. Those actions concretely serve the implementation of the World Conservation Strategy. While a number of actions are of a permanent nature, the stress is placed on activities which can be carried out in the period 1985-89. In summary, governments and international organizations are invited to undertake activities which will improve and expand the international biosphere reserve network, to develop basic knowledge for conserving ecosystems and biological diversity, and to make biosphere reserves more effective in linking conservation and development in fulfilling the broad objectives of MAB. Although each government has its own priorities, from an international perspective there is a minimum set of activities which should be implemented in each biosphere reserve and for which international organizations should provide support as appropriate. These are: baseline inventories of flora and fauna and their uses; monitoring; preparation of a history of research; establishment of research facilities and research programmes; establishment of training and education programmes; and preparation of a management plan which addresses biosphere reserve functions. The approved Action Plan, together with an indication of financing requirements, will be submitted in due course for consideration by the governing organs of UNEP, Unesco, FAO and IUCN.

Introduction

1. The Man and the Biosphere (MAB) Programme, launched in 1971, is a worldwide programme of international scientific co-operation dealing with people-environment interactions in the whole range of bioclimatic and geographic situations of the biosphere—from polar to tropical zones, from islands and coastal areas to high mountain regions, from sparsely populated regions to dense human settlements. Research under the MAB Programme is designed to provide the information needed to solve practical problems of resource management. It also aims to fill the still significant gaps in the understanding of the structure and function of ecosystems, and of the impact of different types of human intervention. Key ingredients in the MAB Programme are the involvement of decision-makers and local people in research projects, training and demonstration in the field and the pooling of disciplines from the social, biological and physical sciences in addressing complex environmental problems.

2. The International Co-ordinating Council which supervises the MAB Programme, at its first session in 1971, decided that one of the themes of this programme was to be the 'conservation of natural areas and the genetic material they contain'. Under this theme was introduced the concept of the biosphere reserve which was intended to be a series of protected areas, linked through a co-ordinated international network, which would demonstrate the value of conservation and its relationship with development. The concept was innovative because of this network character and because it combined nature conservation with scientific research, environmental monitoring, training, demonstration, environmental education and local participation.

3. Since the very beginning of the implementation of the concept of biosphere reserves as representative ecological areas, the international biosphere reserve network has formed a geographic focus for implementing the MAB Programme.

4. The first biosphere reserves were designated in 1976. Subsequently, the network has grown steadily until 1984; at present, it consists of a total of 243 in 65 countries. In this same period, co-operation with other international organizations involved with conservation and sustainable development has been strengthened, particularly the Food and Agriculture Organization (FAO), the United Nations Environment Programme (UNEP) and the International Union for Conservation of Nature and Natural Resources (IUCN). Representatives of these organizations meet together regularly through the Ecosystem Conservation Group to co-ordinate action.

5. FAO has a major interest in biosphere reserves because of their contribution to the *in situ* conservation of genetic resources, especially wild crop relatives, forest species, and ancestors and close relatives of domestic livestock. UNEP is promoting the value of the international network for conservation in general, and in particular, for environmental monitoring using comparable methodologies and parameters. IUCN considers that biosphere reserves constitute a useful concept for regional planning in which conservation is linked directly with sustainable development, in line with the World Conservation Strategy.

6. It was therefore in the joint interests of FAO, UNEP, IUCN and Unesco that the First International Biosphere Reserve Congress was convened in 1983 to review the experience of the past ten years and to establish a general framework to guide the future development of the biosphere reserve network.

The characteristics of biosphere reserves

7. The main characteristics of biosphere reserves are:

(a) Biosphere reserves are protected areas of representative terrestrial and coastal environments which have been internationally recognized for their value in conservation and in providing the scientific knowledge, skills and human values to support sustainable development.

(b) Biosphere reserves are united to form a worldwide network which facilitates sharing of information relevant to the conservation and management of natural and managed ecosystems.

(c) Each biosphere reserve includes representative examples of natural or minimally disturbed ecosystems (core areas) within one of the world's biogeographical provinces; and as many of the following types of areas as possible:

(i) centres of endemism and of genetic richness or unique natural features of exceptional scientific interest (which may be part or all of the core area);

(ii) areas suitable for experimental manipulation to develop, assess and demonstrate the methods for sustainable development;

(iii) examples of harmonious landscapes resulting from traditional patterns of land use;

(iv) examples of modified or degraded ecosystems that are suitable for restoration to natural or near-natural conditions.

Collectively, the various types of above areas provide the framework for carrying out the scientific and management functions of biosphere reserves.

(d) Each biosphere reserve should be large enough to be an effective conservation unit, and have value as a benchmark for measurements of long-term changes in the biosphere.

(e) Biosphere reserves should provide opportunities for ecological research, education, demonstration and training.

(f) The 'buffer zone' may consist of any one or some combination of (ii) to (iv) of (c) above, which are areas suitable or used for research purposes. In addition, the 'buffer zone' may also include a large area which may be undelineated but where efforts are made to develop co-operative activities which ensure that uses are managed in a manner compatible with the conservation and research functions of the other areas of the reserve cited in (c) above. This multiple-use area may contain a variety of agricultural activities, settlements and other uses and may vary in space and time, thus forming an 'area of co-operation' or 'zone of influence'.

(g) Biosphere reserves must have adequate long-term legislative, regulatory or institutional protection. Biosphere reserves may coincide with or incorporate existing or proposed protected areas, such as national parks or protected research sites. This is because some of these protected areas are often the best examples of the natural unaltered landscape or because they constitute suitable areas for carrying out the various functions of biosphere reserves.

(h) People should be considered as part of a biosphere reserve. People constitute an essential component of the landscape and their activities are fundamental for its long-term conservation and compatible use. People and their activities are not excluded from a biosphere reserve; rather they are encouraged to participate in its management and this ensures a stronger social acceptance of conservation activities.

(i) Normally, there is no need for changes in land-holding or regulation following the designation of a biosphere reserve except where changes are required to ensure the strict protection of the core area or of specific research sites.

8. The above characteristics however may give an insufficient impression of the breadth of the concept. Successful biosphere reserves constitute models of the harmonious marriage of conservation and development. They provide visible examples of the application of the World Conservation Strategy—sustainable development in action.

Functions of biosphere reserves

Conservation as an open system

9. Although it has long been clear that the whole variety of organisms and ecosystems cannot be safeguarded satisfactorily for ever if their sole refuges are protected areas of the more conventional types, this is the only approach that has been applied widely in practice so far. If genetic conservation is to be successful in weathering natural and man-induced environmental change, a more open system of conservation is required, in which areas of undisturbed natural ecosystems can be surrounded by areas of sympathetic and compatible use. The biosphere reserve provides these conditions. It should, perhaps, be looked upon less as a 'reserve' than as an area of ecologically representative landscape in which land-use is controlled, but may range from complete protection to intensive, yet sustainable, production. Under certain circumstances these areas need not even be contiguous but separate from one another ('cluster concept' of biosphere reserves). This arrangement of graded control allows for a flexibility of treatment that is necessary if conservation is to be assured under changing circumstances.

10. Because they contain a substantial proportion of the indigenous flora and

fauna of a biogeographic region, biosphere reserves are important reservoirs of genetic material. These resources increasingly find application in developing new pharmaceuticals, industrial chemicals, building materials, food sources, pest control agents, and other products to improve human well-being. The genetic resources of biosphere reserves also may provide genetic material for re-establishing indigenous species in areas where they have been eradicated, thereby enhancing the stability and diversity of regional ecosystems. Within particular natural regions, biosphere reserves are linked to form local and regional networks with other types of protected areas which safeguard complementary ecosystems and elements of biological diversity.

11. A unique aspect of biosphere reserves is the conservation, where practicable, of traditional land use systems, illustrating harmonious relationships between indigenous populations and the environment. These systems often reflect centuries of human experience and can provide information of immense value in improving the productivity and sustainability of modern land use and management practices. In addition to providing important sites for scientific study, the inclusion of such areas can help to foster pride on the part of local populations in their traditions; and to provide the basis for improving their means of livelihood, through the judicious use of science and technology, in ways which respect these traditions.

Research and monitoring function

12. Because of their secure protection, generally large size, and the inclusion of areas free from significant human impact, biosphere reserves typically provide ideal sites for monitoring changes in the physical and biological components of the biosphere. Their protection and scientific mission make biosphere reserves particularly attractive sites for gathering scientific information. Scientists can have more confidence than in most other areas that the integrity of study sites will be respected, and that collected data will contribute to a growing data bank of increasing scientific significance. As land use changes and human impacts progressively decrease the availability of suitable monitoring sites, scientific interest in biosphere reserves will increase.

13. In most protected areas, research is a secondary function which is intended to provide information to enable effective response to immediate resource management problems within the protected areas themselves. In biosphere reserves, interdisciplinary research programmes involving the natural and social sciences are encouraged to develop models for sustainable conservation of the ecosystems of a large natural region. Biosphere reserves provide sites for co-ordinated research, including research to determine requirements for conserving biological diversity, to assess the impacts of pollution on the structure and functions of ecosystems, to evaluate the effects of traditional and modern land use practices on ecosystem processes, and to develop sustainable production systems for degraded areas.

14. Additionally, the international network provides a framework for comparative studies of similar problems in different parts of the world; for testing, standardizing and transferring new methodologies; and for co-ordinating the development of information management systems.

The education and training function

15. Biosphere reserves can serve as important field centres for the education and training of scientists, resource managers, protected area administrators, visitors, and local people. The strong emphasis on developing educational and training programmes within biosphere reserves is probably unique. The nature of these programmes depends on the particular conditions, capabilities, and needs of the biosphere reserve and the surrounding region. However, the following kinds of activities are generally encouraged: academic and professional training; environmental education; demonstration and extension; training for local people supplemented by the provision of employment opportunities.

The co-operation function

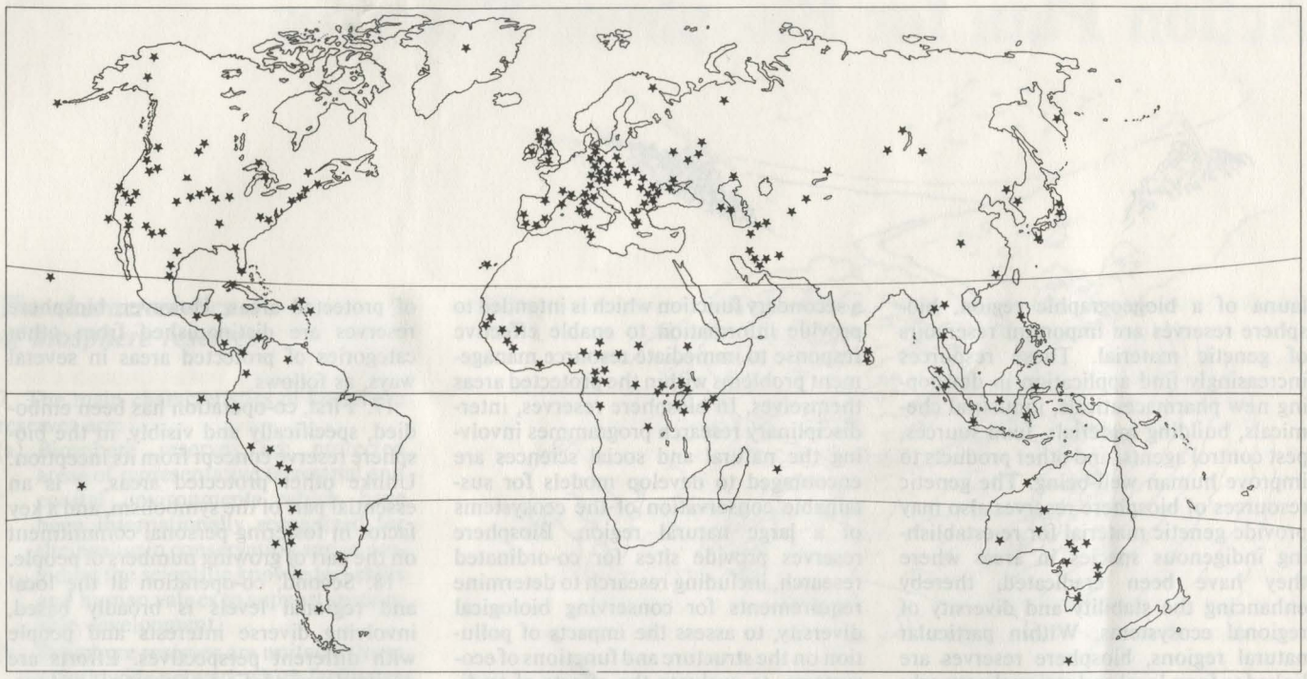
16. Co-operation not only serves as the master integrator of the other functions, but also provides the moral force behind the biosphere reserve concept. Biosphere reserve status can provide a framework for improving co-operation at the local, regional, and international level. Co-operation is increasingly regarded as an aspect of good management for all categories of protected areas. However, biosphere reserves are distinguished from other categories of protected areas in several ways, as follows.

17. First, co-operation has been embodied, specifically and visibly, in the biosphere reserve concept from its inception. Unlike other protected areas, it is an essential part of the symbolism, and a key factor in fostering personal commitment on the part of growing numbers of people.

18. Second, co-operation at the local and regional levels is broadly based, involving diverse interests and people with different perspectives. Efforts are directed towards finding practical and sustainable strategies for dealing with complex and interrelated environmental, land use, and socio-economic problems affecting a particular biogeographic region. For this reason, the range of interests involved in planning and implementing the biosphere reserve concept typically includes biosphere reserve administrators, natural and social scientists, resource managers, environmental and development interests, government decision-makers and local people. Communication between these groups is based on the need to integrate conservation and development within the biogeographic region, and on the recognition of the value of a biosphere reserve. Through these co-operative efforts, an area around the biosphere reserve can eventually be developed, which represents a zone of influence in which co-operative activities and harmonious land uses can be implemented. The spatial dimensions of this area expand as more participants co-operate in building the biosphere reserve. Developing the network of co-operation for carrying out the mission of the biosphere reserve is an open-ended process.

19. Biosphere reserves can also provide the catalyst for establishing appropriate mechanisms to marshal the professional capabilities of government agencies and academic institutions to provide a perspective on the ecosystem use and management problems of particular regions.

20. Finally, all biosphere reserves are part of the international network, which provides a framework for communication within and among biogeographic regions. Co-operation involves the sharing of technology and information, and the development of co-ordinated monitoring and research projects, to provide better information on problems of common interest. Biosphere reserves are particularly suit-



able for co-operative monitoring of regional and global pollutants and their effects on natural and managed ecosystems, for co-operative ecosystem modelling, for assessment and forecasting, and in comparative assessment of alternative systems for managing renewable resources. Co-operation may also involve the exchange and training of specialists to assist in selecting biosphere reserves and developing their functions.

The Action Plan

21. There are three main thrusts in the programme framework of the Action Plan, all designed to promote and implement the concept of the biosphere reserve and to make it a more effective agent for sustainable development. These are: improving and expanding the network; using the network to increase knowledge; and making biosphere reserves more effective in demonstrating the value of integrating conservation and development.

Improving and expanding the network

22. One of the principal objectives of the Action Plan is to improve and expand the world coverage of biosphere reserves by including: (a) representative ecological areas within each of the world's biogeographical regions, in their natural state and as modified by man to varying degrees; (b) centres of endemism and of genetic richness; and (c) areas for carrying the full range of biosphere reserve functions.

Developing basic knowledge for conserving ecosystems and biological diversity

23. A number of actions are concerned with generating and disseminating useful knowledge, in particular: (a) using biosphere reserves for background global monitoring of chosen biological, chemical and physical variables; (b) carrying out research in basic ecological processes, which can be applied in management, and in 'conservation science'; (c) monitoring the results and effectiveness of management; (d) assembling traditional knowledge about the use of species and ecosystems; and (e) spreading all such knowledge by example, publication, wide dissemination in various other forms, training, exchange of staff and of local people and by setting up demonstration biosphere reserves to illustrate these matters to a wide public.

Making biosphere reserves more effective in linking conservation and development

24. Existing and new biosphere reserves are to be made more effective in various ways: (a) ensuring that biosphere reserves meet the criteria and serve the purposes intended for them, and are not just other sorts of protected areas given another name; (b) guaranteeing their protection by legislation and/or management; (c) linking goals of conservation and development; (d) improving the effectiveness of management and monitoring the standards of management; (e) incorporating in present and future management the traditional skills of those who live in and around biosphere reserves; and (f) ensuring the understanding and participation of local people who are affected by the biosphere reserves.

25. Although it is expected that biosphere reserves will be established and maintained on a permanent basis, the Action Plan concentrates on recommendations for action during the period 1985 to 1989, which coincides with the United Nations Systems-wide Medium-term Environment Programme as well as the medium-term plans of several of the sponsoring organizations. It is designed to be both realistic and practical. Some actions will be initiated or undertaken by United Nations organizations (in particular Unesco, UNEP, FAO, WHO and WMO) and by IUCN. Due consideration will be given to appropriate requirements of the World Conservation Strategy and other relevant action plans such as the United Nations Plan to Combat Desertification. However, most actions will be a matter for individual countries to implement in accordance with their own priorities. Success, therefore, will largely depend on the support of governments—in their domestic policies, in the attitudes they take in the governing bodies of international organizations and in asking for and giving technical assistance.

26. This Action Plan presents a set of recommended actions which governments and international organizations can implement, better to fulfil the functions of biosphere reserves. Given a reasonable level of funding and international support, substantial progress can be made in implementing most of these recommendations by 1989. It is proposed that a meeting be held to review the progress made and draw up directions for future actions in 1990.

27. Every government establishes its own priorities for implementing activities in biosphere reserves. These activities all contribute to the worldwide network to the extent that their results are shared among the co-operating nations. However, from an international perspective,

Schematic map indicating the location of existing biosphere reserves. At the end of 1984, 243 biosphere reserves had been designated in 65 countries. In some areas, particularly Europe, where their density is high, individual stars may correspond to several biosphere reserves.

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there is a minimum set of activities which should be implemented in each biosphere reserve. These include:

- Baseline inventories of species of fauna and flora and their present and traditional uses (to provide the basis for further research, monitoring, and information activities).
- Establishment of procedure for monitoring key biological parameters.
- Preparation of a history of research, which specifies what research has been carried out and includes a complete bibliography of relevant publications, as well as an analysis of the relationship with other ongoing pilot projects, and especially national or international projects of the MAB Programme.
- Establishment of research facilities and a research programme which outlines the research activities envisaged for the following five years or so.
- Establishment of a training/education programme appropriate for local needs and conditions.
- Preparation of a management plan which specifies the steps to be taken in developing biosphere reserve functions (this may often involve only minor alterations to existing management plans).

Objectives and actions

Objective 1. International network: to enhance the role of the international network of biosphere reserves in global ecosystem conservation

28. In spite of vigorous action during the past decade to make governments aware of the importance of biosphere reserves and to promote their establishment, there are still many gaps and deficiencies in the network.

- Many important representative types of ecosystem are still to be included, especially of coastal and aquatic ecosystems.
- Only a few biosphere reserves established so far cover the full range of purposes for which biosphere reserves were intended.
- Few reserves have been established which include centres of high biological diversity and endemism, particularly the centres of concentration of the wild relatives of economically important plants and animals.
- The significance of the biosphere reserve concept and the added importance of having a network are not fully appreciated, so a number of countries have not yet responded, and others have proposed areas that only partially profit from the advantages offered by this concept of land use.

29. This is an important objective; because, without a full network, many of the other objectives can only be partially satisfied. Action on it is, therefore, crucial. Promotion of the philosophy of the biosphere reserve and strengthening the network are, of course, tasks that will never be fully complete; but it should be possible by 1990 to lay firm groundwork for subsequent continuing action.

Recommended actions

Action 1. In order to provide the basis for a rational selection of biosphere reserves that would give a complete biogeographical cover, IUCN, in co-operation with UNEP, should prepare and publish: Classification of 'representative ecological areas' on land; and classification of 'representative ecological areas' covering intertidal and marine habitats in coastal areas.

Action 2. In order to move rapidly and systematically in expanding the network of biosphere reserves, Unesco, UNEP, FAO and IUCN should co-ordinate their planned activities and develop a phased programme to identify gaps in ecosystem representation and biosphere reserve functions, and to stimulate action based on these evaluations. The results of these evaluations should be widely publicized.

Action 3. Governments should be urged to take such action as appropriate to fill the identified gaps in ecosystem representation and biosphere reserve functions. In this they are encouraged to consult and co-operate with the governments of neighbouring countries to develop a coherent and co-ordinated approach. Governments should also develop basic information for refining and accelerating the selection of biosphere reserves, and should take full advantage of recent advances in remote-sensing.

Action 4. In order to take the first steps in establishing a series of biosphere reserves covering the main areas of specific and genetic diversity, FAO and IUCN should develop a survey of centres of endemism, and of centres of concentration of wild relatives of economic species, starting with a pilot project for one biogeographic realm and for a few selected groups of organisms. Following completion of the pilot project, Unesco, UNEP, FAO and IUCN should, if appropriate, develop a programme for extending the project to other parts of the world and to other groups.

Action 5. In order to make the network of aquatic and wetland biosphere reserves more complete and effective, IUCN should convene a working group to examine the special managerial, legislative and institutional problems related to such reserves and develop necessary guidelines for their solution.

Action 6. Unesco should immediately establish a Biosphere Reserve Scientific Advisory Panel to refine criteria for the selection and management of biosphere reserves, to evaluate proposals for new biosphere reserves and to review from time to time the effectiveness of the network.

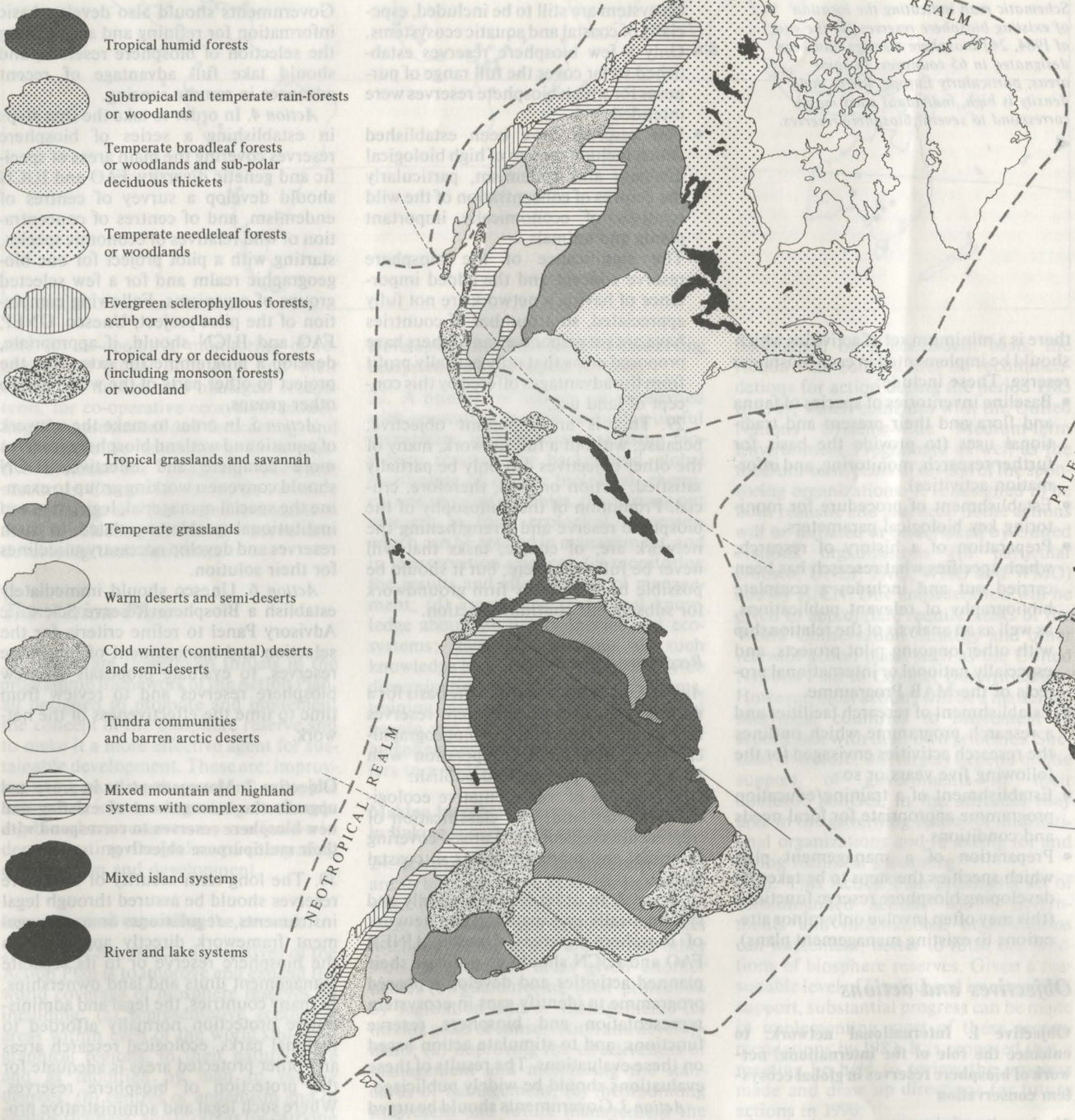
Objective 2. Management: to improve and upgrade the management of existing and new biosphere reserves to correspond with their multipurpose objectives

30. The long-term security of biosphere reserves should be assured through legal instruments, regulations or a management framework directly applicable to the biosphere reserve or to its separate management units and land ownerships. In many countries, the legal and administrative protection normally afforded to national parks, ecological research areas and other protected areas is adequate for the protection of biosphere reserves. Where such legal and administrative protection does not exist, it should be developed especially for the area concerned before it is nominated as a biosphere reserve.

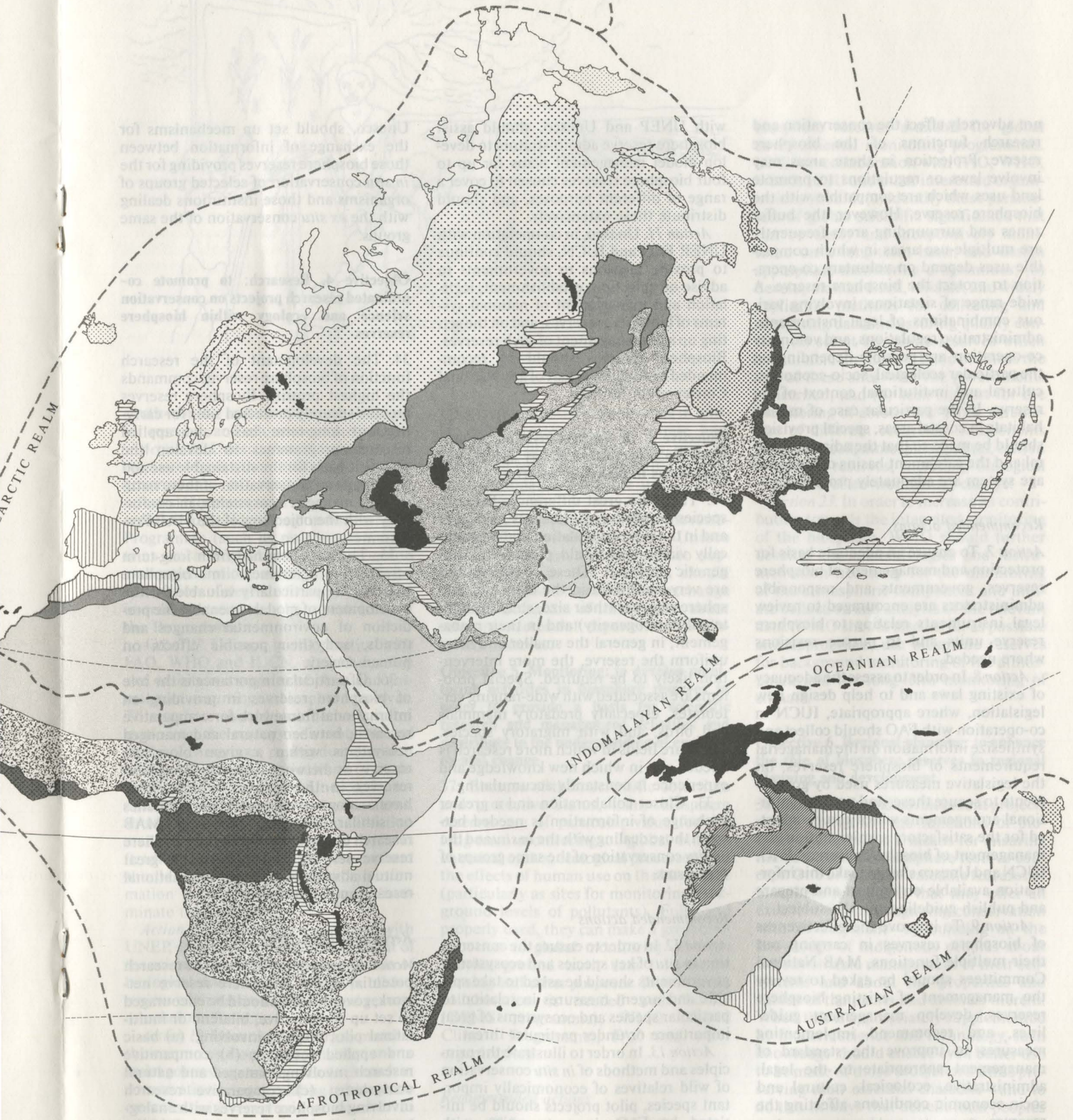
31. In the land surrounding the core area and the research sites, the objective is to encourage uses and activities which do

Map indicating the major biomes of the world. The international network of biosphere reserves is intended to cover systematically all biogeographical provinces. Although existing classifications of these provinces have been used so far, a more detailed and refined classification is being worked out for guiding the further development of the network.

The fourteen major biomes corresponding to the major ecosystem groups of the world



- Tropical humid forests
- Subtropical and temperate rain-forests or woodlands
- Temperate broadleaf forests or woodlands and sub-polar deciduous thickets
- Temperate needleleaf forests or woodlands
- Evergreen sclerophyllous forests, scrub or woodlands
- Tropical dry or deciduous forests (including monsoon forests) or woodland
- Tropical grasslands and savannah
- Temperate grasslands
- Warm deserts and semi-deserts
- Cold winter (continental) deserts and semi-deserts
- Tundra communities and barren arctic deserts
- Mixed mountain and highland systems with complex zonation
- Mixed island systems
- River and lake systems


ARCTIC REALM
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AUSTRALIAN REALM
AFROTROPICAL REALM

not adversely affect the conservation and research functions of the biosphere reserve. Protection in these areas may involve laws or regulations to promote land uses which are compatible with the biosphere reserve. However, the buffer zones and surrounding areas frequently are multiple-use areas in which compatible uses depend on voluntary co-operation to protect the biosphere reserve. A wide range of situations, involving various combinations of legal instruments, administrative regulations, and voluntary co-operation are possible depending on the particular ecological, socio-economic, cultural and institutional context of the reserve. In the particular case of marine habitats in coastal areas, special provision should be made so that the adjacent littoral and the catchment basins of its drainage system are adequately protected.

Recommended actions

Action 7. To ensure an adequate basis for protection and management of biosphere reserves, governments and responsible administrators are encouraged to review legal instruments relating to biosphere reserve units and to pursue revisions where needed.

Action 8. In order to assess the adequacy of existing laws and to help design new legislation, where appropriate, IUCN in co-operation with FAO should collect and synthesize information on the managerial requirements of biosphere reserves, on the legislative measures used by governments to secure these, and on the institutional arrangements which can be adopted for the satisfactory administration and management of biosphere reserves. FAO, IUCN and Unesco should make this information available on request and prepare and publish guidelines on the subject.

Action 9. To improve the effectiveness of biosphere reserves in carrying out their multiple functions, MAB National Committees should be asked to review the management of existing biosphere reserves, develop management guidelines, and recommend implementing measures to improve the standard of management appropriate to the legal, administrative, ecological, cultural and socio-economic conditions affecting the reserves.

Action 10. In order to assist in the task of bringing the management of biosphere reserves up to the highest possible standard, FAO and IUCN, in co-operation with UNEP and Unesco, should assist biosphere reserve administrators to develop model management plans for up to four biosphere reserves chosen to cover a range of different purposes, and should distribute these extensively.

Action 11. Unesco, in co-operation with UNEP, FAO and IUCN, should continue to provide missions to governments to advise on selection, establishment, legislation and management of national systems of biosphere reserves, and on the setting up and management of such reserves. Biosphere reserves should be recommended as an integral part of any National Conservation Strategy.

Objective 3. *In situ* conservation: to promote the conservation of key species and ecosystems in biosphere reserves

32. There are great differences between species in their requirements for space and in the size of population that is genetically viable and would preserve its full genetic potential. These considerations are very significant in the choice of biosphere reserves (their size, shape and internal heterogeneity) and in their management; in general the smaller and more uniform the reserve, the more intervention likely to be required. Special problems are associated with wide-ranging vertebrates, especially predatory mammals and birds, and with migratory species. These are fields in which more research is needed and in which new knowledge and experience is constantly accumulating.

33. Closer collaboration and a greater exchange of information is needed between those dealing with the *in situ* and the *ex situ* conservation of the same groups of organisms.

Recommended actions

Action 12. In order to ensure the conservation *in situ* of key species and ecosystems, governments should be asked to take specific and urgent measures in relation to particular species and ecosystems of great importance or under particular threat.

Action 13. In order to illustrate the principles and methods of *in situ* conservation of wild relatives of economically important species, pilot projects should be initiated by FAO, in co-operation with UNEP, to demonstrate management techniques allowing their conservation in existing or potential biosphere reserves.

Action 14. FAO, in co-operation with Unesco, should set up mechanisms for the exchange of information between those biosphere reserves providing for the *in situ* conservation of selected groups of organisms and those institutions dealing with the *ex situ* conservation of the same groups.

Objective 4. Research: to promote co-ordinated research projects on conservation science and ecology within biosphere reserves

34. The development of the research function of biosphere reserves commands the highest priority. Biosphere reserves provide securely protected sites for carrying out long-term basic and applied research programmes to develop the scientific basis for the sustainable use and the long-term conservation of these natural and managed ecosystems, in conformity with the objectives of the MAB Programme.

35. The data obtained from long-term research programmes in biosphere reserves are particularly valuable for the development of models to enable the prediction of environmental changes and trends, and their possible effects on human society.

36. Of particular importance is the role of biosphere reserves in providing an international framework for comparative research, between natural and managed ecosystems within a given biosphere reserve or between separate biosphere reserves in the network which either have analogous ecological characteristics or similar ecological problems. MAB research undertaken within the biosphere reserve network can be linked, to great mutual advantage, to other international research programmes.

Recommended actions

Action 15. In order to develop the research potential of the biosphere reserve network, governments should be encouraged to set up co-operative, bilateral or multilateral pilot projects involving: (a) basic and applied research; (b) comparative research involving managed and natural ecosystems; (c) comparative research involving biosphere reserves with analogous ecological characteristics or similar ecological problems; (d) application of new technologies (e.g. remote sensing or modelling) in such research; and (e) development and expansion of north–south,

south–south, and north–north linkages for research and educational purposes.

Action 16. Unesco should try to marshal resources from other institutions to assist governments to conduct research in selected biosphere reserves on the priority research topics identified under the MAB Programme (such as on tropical mountains, soil biological processes, succession and regeneration, multipurpose plants, restoration of degraded ecosystems, etc.) in order to strengthen the cohesiveness of the Programme.

Action 17. Unesco, in co-operation with FAO, WHO and IUCN, should develop and maintain a register of plant and animal taxa occurring in biosphere reserves. This register should include basic information on the ecology, distribution and status of these taxa, paying due attention to those of potential agricultural or medical interest. In addition, Unesco, in co-operation with these same organizations, should organize the systematic collection and storage of information on the uses (traditional and modern) of these taxa and should build up a data bank and an information service to synthesize and disseminate this information.

Action 18. Unesco, in co-operation with UNEP, should review the development of the science relating to the conservation of biological diversity and should publish a review of the state-of-the-art and recommendations for action.

Action 19. Unesco should try to marshal the resources from other institutions to assist governments to conduct research in conservation science relating to biosphere reserves, with emphasis on studies to guide the design of protected areas and the management of genetic resources.

Action 20. In order to show how development may be based on local knowledge, Unesco, in co-operation with UNEP, should assist governments to initiate pilot projects to demonstrate how knowledge of traditional uses may be combined with modern scientific work to allow rational, sustainable use of local resources.

Action 21. In order to promote the restoration of degraded ecosystems, Unesco should encourage governments to support research in this field and should develop a mechanism for the exchange and dissemination of information about relevant successful experiences in biosphere reserves.

Objective 5. Monitoring: to develop monitoring activities in biosphere reserves in order to provide a basis for scientific research and management activities and contribute to the understanding of environmental change

37. Because of their scientific objectives and protective status, many biosphere reserves are of particular value for the long-term monitoring of global biogeochemical cycles, ecological processes, and the effects of human use on the biosphere (particularly as sites for monitoring background levels of pollutants). Fully and properly used, they can make a great contribution to global monitoring and can provide ground truth data for remote sensing and other purposes. In this, close collaboration is needed with UNEP (GEMS programme), WMO (World Climate Programme), FAO and other organizations.

Recommended actions

Action 22. In order to maximize the contribution of biosphere reserves to international environmental monitoring programmes, UNEP (GEMS) and Unesco should encourage governments to make biosphere reserves available for global environmental monitoring programmes. UNEP in collaboration with FAO, WHO, WMO, ICSU and other interested organizations should: (a) identify those parameters of global scientific significance that can be easily and inexpensively monitored on a long-term basis, and design appropriate monitoring programmes; (b) develop standardized, reliable, and widely applicable methods for collecting and comparing data and assuring quality control; (c) select biosphere reserves which are suitable for this work and promote the use of these sites with the governments concerned; and (d) seek support for the monitoring of abiotic and biotic parameters of different ecosystem components (e.g. litter, soil, atmosphere, water, etc.) in biosphere reserves, including biological indicators of environmental change.

Action 23. In order to increase its contribution towards the integrated monitoring of the biosphere, WMO should further develop any methodologies and instrumentation necessary for the monitoring of the atmospheric component and initiate collection and analysis of the relevant data. WMO should also, as far as possible and appropriate, use biosphere reserves for background monitoring of the atmosphere and for long-term monitoring of climate.

Objective 6. Regional planning: to enhance the role of biosphere reserves in regional planning and development

38. Integrated rural development projects which strengthen the functions of biosphere reserves are a means for ensuring the success of the biosphere reserve concept. One of the most valuable features of biosphere reserves is that they offer an excellent way of integrating conservation with development—by building on the knowledge of indigenous peoples about the sustainable management of their ecosystems and about the properties and values of the plants and animals therein. When this is appropriately supplemented by modern science and technology, such knowledge should enable even better use to be made of those ecosystems while preserving their essential character—and to do this in ways that benefit local peoples and are acceptable to them. Such measures will also serve to safeguard the primitive cultivars of economic crops. This path of development is especially suitable in many areas of the developing

world but could also be followed with advantage in some of the less favoured rural areas of developed countries.

39. This path may take a number of forms, for example:

- Increasing the productivity of locally adapted systems of farming, in ways that retain the richness of the local flora and fauna and the protective character of the vegetation.
- Developing, around core areas that should be strictly protected as genetic reserves, patterns of more productive yet sustainable land use that are of benefit to local people and are acceptable to them.
- Linking biosphere reserves to major development projects to ensure that these contain appropriate elements of protection and of the sustainable use of local ecosystems.

40. Biosphere reserves, by definition and intent, have economic and social benefits for local people, but also have value in demonstrating sustainable development tied to conservation in the wider biogeographical region. While biosphere reserves have these inherent benefits, they need to be publicized. Biosphere reserves provide a framework demonstrating the economic benefits which can result from the protection of natural and managed ecosystems.

Recommended actions

Action 24. To demonstrate the value of biosphere reserves in integrated regional planning, governments should develop existing biosphere reserves as models of balanced and sustainable development. These models should be used to demonstrate the economic and social benefits of conservation. Where biosphere reserves have not yet been established, governments should set up such areas, and also consider nominating for biosphere reserve designation successful projects which integrate conservation (involving a protected area) and rural development, or projects which have such potential.

Action 25. In order to ensure that large development projects contain the requisite elements of conservation, the World Bank and other international and regional development-financing organizations should ensure that any development project financed by them should not affect the basic functions of existing biosphere reserves. These organizations should support the establishment of biosphere

reserves as a compensatory measure to mitigate the adverse ecological effects of the development project, financed by them, which would affect major ecosystems. They should also consider support for rural development projects involving biosphere reserves which will help to develop the full range of biosphere reserve functions.

Objective 7. Local participation: to promote local participation in the management of biosphere reserves

41. For biosphere reserves to be successful, it is essential that they be locally acceptable. This is not always easy for a number of reasons. There may be conflict between the requirements of short-term economic pursuits and conservation; there may be different local views on land use; and the local and national interests may diverge. Careful consultation and planning are necessary, as well as a continual dialogue involving tact, understanding and imagination.

42. Moreover, the situation is seldom stable. Growing populations, changing expectations, improved technology or communications, and economic pressures from outside may change the whole pattern of land use and local perceptions of priorities. The biosphere reserve should be able to evolve in harmony with all these changes to enable local populations to adjust to demographic and economic transitions without environmental deterioration.

Recommended actions

Action 26. In order to obtain the commitment of people who live in or adjacent to biosphere reserves, governments should ensure that these people are encouraged to participate in planning for the management of the area. Where possible, they should also participate in the scientific research, monitoring, and other activities taking place in the reserve. Furthermore, governments should encourage the setting up of mechanisms for consultation so that conflicts may be resolved and changing local perceptions may be reflected in the management of the reserve.

Action 27. Unesco, in co-operation with governments, should develop pilot projects in biosphere reserves to demonstrate the successful involvement of local people, and should arrange for the transfer of staff, knowledge and skills among such projects.

Action 28. Unesco, in co-operation with governments, should collect and disseminate information about successful arrangements for consultation and participation. Unesco should in particular encourage studies on the mechanism of participation of institutions and local people in the development of biosphere reserve functions under different social, economic and cultural conditions.

Objective 8. Environmental education and training: to promote environmental education and training related to biosphere reserves and to use the full potential of the reserves for these purposes

43. Biosphere reserves play a valuable role in environmental education and in the training of specialists and practitioners. They can introduce local people to the idea that protecting natural areas and sustainable development are to their benefit. Local people could also be made aware of the wider national and international significance of the areas in which they live. Biosphere reserves could also be used much more in educating various sectors of the public in these same things.

44. The network would also provide ideal conditions for training resource managers and research workers. Because of the special features of the network, there are exceptional opportunities for sharing experience of working in comparable ecosystems and analogous conditions in other parts of the world, and for developing special relations in international training between pairs or groups of institutions with shared problems or interests.

Timeframe, relative priorities and status of the actions recommended in the Action Plan for Biosphere Reserves
(—— main effort; – – – continuing activity).

Actions	Synopsis	1985	1986	1987	1988	1989	Co-operating entities	Priority	Status (X = ongoing)
International network									
1	Classification of 'representative ecological areas'	——	——				IUCN, UNEP	1	X
2	Identification of gaps in ecosystem representation and biosphere reserve functions	——	——	——	——	——	Unesco, UNEP, FAO and IUCN	1	X
3	Filling gaps in ecosystem representation and biosphere reserve functions	——	——	——	——	——	Governments	1	–
4	Survey of centres of endemism		——	– – –	– – –	– – –	FAO, IUCN, Unesco, UNEP	1	–
5	Management, legislative and institutional problems of wetland biosphere reserves		——				IUCN	1	–
6	Establish a Biosphere Reserve Scientific Advisory Panel	——	– – –	– – –	– – –	– – –	Unesco	1	–
Management									
7	Review legal instruments on biosphere reserves	——	——	– – –	– – –	– – –	Governments	2	–
8	Collection, synthesis and dissemination of information on legislative measures		——	——	– – –	– – –	IUCN, FAO, Unesco	2	–
9	Review biosphere reserve management and develop management guidelines	——	——	– – –	– – –	– – –	Governments	1	–
10	Develop model management plans and pilot projects	– – –	——	——	——	——	FAO, IUCN, UNEP, Unesco	2	–
11	Missions to advise governments on selection, establishment, legislation and management of biosphere reserves	——	——	——	——	——	Unesco, UNEP, FAO and IUCN	1	X
In situ conservation									
12	Special and urgent protection of species and ecosystems under threat	– – –	– – –	——	——	——	Governments	1	X
13	*In situ* conservation of wild relatives	——	——	——	——	——	FAO, UNEP	1	–
14	Mechanisms for information exchange between *in situ* biosphere reserves and *ex situ* institutions	——	——	– – –	– – –	– – –	FAO, Unesco	2	–
Research									
15	Develop research potential of biosphere reserves	——	——	– – –	– – –	– – –	Governments	1	–
16	Marshal resources for priority MAB research	——	——	– – –	– – –	– – –	Unesco	2	–
17	Register of plant and animal taxa in biosphere reserves	——	– – –	– – –	– – –	– – –	Unesco, FAO, WHO and IUCN	1	X
18	Prepare state-of-the-art on conservation science with recommendations for action	——	——	– – –	– – –	——	Unesco, UNEP	1	–
19	Marshal resources to conduct research in conservation science in biosphere reserves		——	——	– – –	– – –	Unesco	2	–
20	Initiate pilot projects on traditional uses combined with modern science			——	——	——	Unesco, UNEP	2	–
21	Support research and information exchange on restoration of degraded ecosystems	– – –	– – –	——	– – –	– – –	Unesco	2	X
Monitoring									
22	Identify parameters of global scientific significance	——	——	– – –	– – –	– – –	UNEP, Unesco, FAO, WHO, WMO, ICSU	1	X
23	Use of biosphere reserves for atmospheric monitoring and long-term monitoring of climate	– – –	——	——	– – –	– – –	WMO	1	X
Regional planning									
24	Develop model biosphere reserves to demonstrate value in integrated regional planning	– – –	——	——	——	——	Governments	1	X
25	Involve biosphere reserves in development projects	——	——	——	——	——	World Bank, development financing organizations	1	X
Local participation									
26	Ensure local involvement in biosphere reserves	——	——	——	——	——	Governments	1	X
27	Develop pilot projects based upon principles of local involvement		——	– – –	——	– – –	Unesco	2	–
28	Disseminate information and study mechanisms for the participation of local people in biosphere reserves			——	——	——	Unesco	1	X
Education and training									
29	Strengthen environmental education function in biosphere reserves	——	——	——	——	——	Unesco	1	X
30	Promote conservation in curricula and use of biosphere reserves in field training		——	——	– – –	– – –	Unesco	2	–
Information									
31	Prepare and distribute promotional material on biosphere reserves	——	– – –	– – –	– – –	– – –	Unesco, UNEP, IUCN	1	–
32	Develop decentralized information system on biosphere reserves	– – –	——	– – –	– – –	– – –	Unesco	2	–
33	Governments to contribute to this information system	——	——	——	——	——	Governments	1	X
34	Use existing information systems to disseminate biosphere reserve data		——	– – –	– – –	– – –	Unesco	2	–
35	Develop model biosphere reserves in range of ecological and socio-economic context	——	——	——	——	——	Unesco	1	X

Recommended actions

Action 29. Unesco should assist governments to strengthen the environmental education function of biosphere reserves, and to provide facilities which will heighten the awareness of local people and visitors on environmental matters.

Action 30. Unesco should assist governments to include conservation as a subject in the curricula of training institutions, with particular reference to the role of the biosphere reserve concept and network, and to use their biosphere reserves for field training of specialists in ecology and life sciences, as well as future biosphere reserve managers.

Objective 9. Information: to use fully the potential of the network to generate and spread knowledge about the conservation and management of the biosphere and to promote the biosphere reserve concept through information and demonstration

45. An important purpose of the biosphere reserve network is the generation and dissemination of knowledge. This concept of an information network, in particular, distinguishes biosphere reserves from other protected areas. The full potential of this aspect of the biosphere reserve network should be developed.

46. It is important that the information from biosphere reserves be published in scientific literature, in the form of guidelines and handbooks presented as attractive and persuasive materials for various sectors of the public. Personal contact is also very important. The exchange of people among biosphere reserves can play a vital role in enabling the sharing of skills and experience.

Recommended actions

Action 31. Unesco, in co-operation with UNEP and IUCN, should prepare and distribute attractive brochures and audio-visual material which would explain the characteristics and functions of biosphere reserve networks to a wide audience.

Action 32. To develop the biosphere reserve information system, Unesco should: (a) determine a suitable structure for a decentralized system for collection, storage, synthesis, evaluation and dissemination of information associated with biosphere reserves; (b) define the various potential users and beneficiaries of the particular kinds of information; (c) establish mechanisms that ensure that this information reaches the intended users.

Action 33. Governments should be asked to contribute to the biosphere reserve information system by providing the following types of information: (a) publications and audio-visual material relating directly to the biosphere reserve concept; (b) basic information on the geographical, biological (including species' lists), and social characteristics of each biosphere reserve; (c) bibliography of scientific literature relating to individual biosphere reserves; (d) legislative and administrative provisions for biosphere reserves; (e) the details of management plans; (f) history of relevant research and monitoring.

Action 34. Unesco should use already existing information systems to disseminate scientific bibliographies and data relating to biosphere reserves.

Action 35. Unesco should encourage governments to develop model biosphere reserves which demonstrate to the international scientific community, to national and local leaders, and to politicians and decision makers the usefulness and international importance of biosphere reserves for conservation, science and society. ■