

Mountains are an important source of water, energy and biological diversity. Furthermore, they are a source of such key resources as minerals, forest products and agricultural products and of recreation. As a major ecosystem representing the complex and interrelated ecology of our planet, mountain environments are essential to the survival of the global ecosystem. Mountain ecosystems are, however, rapidly changing. They are susceptible to accelerated soil erosion, landslides and rapid loss of habitat and genetic diversity. On the human side, there is widespread poverty among mountain inhabitants and loss of indigenous knowledge. As a result, most global mountain areas are experiencing environmental degradation. Hence, the proper management of mountain resources and socio-economic development of the people deserves immediate action.

About 10 per cent of the world's population depends on mountain resources. A much larger percentage draws on other mountain resources, including and especially water. Mountains are a storehouse of biological diversity and endangered species. The two programme areas included in this chapter further elaborate the problem of fragile ecosystems with regard to all mountains of the world.

A Generating and strengthening knowledge about the ecology and sustainable development of mountain ecosystems

Basis for action Mountains are vulnerable to human and natural ecological imbalance. Mountains are the areas most sensitive to all climatic changes in the atmosphere. Specific information on ecology, natural resource potential and socio-economic activities is essential. Mountain and hillside areas hold a rich variety of ecological systems. Because of their vertical dimensions, mountains create gradients of temperature, precipitation and insolation. A given mountain slope may include several climatic systems – such as tropical, subtropical, temperate and alpine – each of which represents a microcosm of a larger habitat diversity. There is, however, a lack of knowledge of mountain ecosystems. The creation of a global mountain database is therefore vital for launching programmes that contribute to the sustainable development of mountain ecosystems.

Objectives

- a** To undertake a survey of the different forms of soils, forest, water use, crop, plant and animal resources of mountain ecosystems, taking into account the work of existing international and regional organizations;
- b** To maintain and generate database and information systems to facilitate the integrated management and environmental assessment of mountain ecosystems, taking into account the work of existing international and regional organizations;
- c** To improve and build the existing land/water ecological knowledge base regarding technologies and agricultural and conservation practices in the mountain regions of the world, with the participation of local communities;
- d** To create and strengthen the communications network and information clearing-house for existing organizations concerned with mountain issues;
- e** To improve coordination of regional efforts to protect fragile mountain ecosystems through the consideration of appropriate mechanisms, including regional legal and other instruments;
- f** To generate information to establish databases

and information systems to facilitate an evaluation of environmental risks and natural disasters in mountain ecosystems.

- Management-related activities** Governments at the appropriate level, with the support of the relevant international and regional organizations, should:
- a** Strengthen existing institutions or establish new ones at local, national and regional levels to generate a multidisciplinary land/water ecological knowledge base on mountain ecosystems;
 - b** Promote national policies that would provide incentives to local people for the use and transfer of environment-friendly technologies and farming and conservation practices;
 - c** Build up the knowledge base and understanding by creating mechanisms for cooperation and information exchange among national and regional institutions working on fragile ecosystems;
 - d** Encourage policies that would provide incentives to farmers and local people to undertake conservation and regenerative measures;
 - e** Diversify mountain economies, *inter alia*, by creating and/or strengthening tourism, in accordance with integrated management of mountain areas;
 - f** Integrate all forest, rangeland and wildlife activities in such a way that specific mountain ecosystems are maintained;
 - g** Establish appropriate natural reserves in representative species-rich sites and areas.

Financing and cost evaluation \$50 million from the international community on grant or concessional terms.

B Promoting integrated watershed development and alternative livelihood opportunities

Basis for action Nearly half of the world's population is affected in various ways by mountain ecology and the degradation of watershed areas. About 10 per cent of the Earth's population lives in mountain areas with higher slopes, while about 40 per cent occupies the adjacent medium- and lower-watershed areas. There are serious problems of ecological deterioration in these watershed areas. For example, in the hillside areas of the Andean countries of South America a large portion of the farming population is now faced with a rapid deterioration of land resources. Similarly, the mountain and upland areas of the Himalayas, South-East Asia and East and Central Africa, which make vital contributions to agricultural production, are threatened by cultivation of marginal lands due to expanding population. In many areas this is accompanied by excessive livestock grazing, deforestation and loss of biomass cover.

Soil erosion can have a devastating impact on the vast numbers of rural people who depend on rainfed agriculture in the mountain and hillside areas. Poverty, unemployment, poor health and bad sanitation are widespread. Promoting integrated watershed development programmes through effective participation of local people is a key to preventing further ecological imbalance. An integrated approach is needed for conserving, upgrading and using the natural resource base of land, water, plant, animal and human resources. In addition, promoting alternative livelihood opportunities, particularly through development of employment schemes that increase the productive base, will have a significant role in improving the standard of living among the large rural population living in mountain ecosystems.

Mountains are most sensitive to all climatic changes in the atmosphere and often contain several climatic systems. There is a lack of knowledge of mountain ecosystems and a database is a vital component of sustainable mountain development.



Objectives

- a** By the year 2000, to develop appropriate land-use planning and management for both arable and non-arable land in mountain-fed watershed areas to prevent soil erosion, increase biomass production and maintain the ecological balance;
- b** To promote income-generating activities, such as sustainable tourism, fisheries and environmentally sound mining, and to improve infrastructure and social services, in particular to protect the livelihoods of local communities and indigenous people;
- c** To develop technical and institutional arrangements for affected countries to mitigate the effects of natural

disasters through hazard-prevention measures, risk zoning, early-warning systems, evacuation plans and emergency supplies.

- Management-related activities** Governments at the appropriate level, with the support of the relevant international and regional organizations, should:
- a** Undertake measures to prevent soil erosion and promote erosion-control activities in all sectors;
 - b** Establish task forces or watershed development committees, complementing existing institutions, to coordinate integrated services to support local initiatives in animal husbandry, forestry, horticulture and rural development at all administrative levels;
 - c** Enhance popular participation in the management of local resources through appropriate legislation;
 - d** Support non-governmental organizations and other private groups assisting local organizations and communities in the preparation of projects that would enhance participatory development of local people;
 - e** Provide mechanisms to preserve threatened areas that could protect wildlife, conserve biological diversity or serve as national parks;
 - f** Develop national policies that would provide incentives to farmers and local people to undertake conservation measures and to use environment-friendly technologies;
 - g** Undertake income-generating activities in cottage and agro-processing industries, such as the cultivation and processing of medicinal and aromatic plants;
 - h** Undertake the above activities, taking into account the need for full participation of women, including indigenous people and local communities, in development.

Financial and cost evaluation \$13 billion including about \$1.9 billion from the international community on grant or concessional terms.

Financing for the promotion of alternative livelihoods in mountain ecosystems should be viewed as part of a country's anti-poverty or alternative livelihoods programme, which is also discussed in chapter 3 and chapter 14.