**PROBLEMS IN THE MOUNTAIN ENVIRONMENT**

People who live in mountain areas are usually much more aware of the limitations of their environment because of the limited habitable area and environmental extremes associated with steep topography and high altitudes. That is why there is a special unit on mountain problems. There are parallel units on other special environments, like islands and drylands.

Mountain environments are most significant in the Himalayas of central Asia, the Alps and their eastward extensions in Europe, the Pyrenées between France and Spain, and the chains of mountains along the western margins of North and South America.

**WIDESPREAD ENVIRONMENTAL PROBLEMS**

The following are qualitative descriptions of the most pressing environmental concerns facing most mountain areas.

**Water Management**

Mountains are often the major water sources for surrounding continental areas. An accumulating snow pack in the winter melts in the spring and summer, helping to even out the runoff through the year. If there are glaciers, they provide even greater water storage and regular runoff, but with climate change and global warming, they are fast disappearing. Dams are often built in mountain areas to generate hydroelectric power and for flood control.

To maintain these important functions of mountains in water management, care must be taken to maintain vegetation cover in watersheds, or erosion and landslides or avalanches may result. Mountain lakes and streams are naturally poor in nutrients and are particularly susceptible to pollution.

**Soil Loss**

Steep mountain slopes are particularly susceptible to soil loss through erosion if the vegetation cover is damaged or removed. Soil is very slow to regenerate in mountain areas, so eroded areas may be permanently degraded. The productive soil is not only lost from the mountain slopes, but it pollutes streams, reducing habitat for fish, and fills lakes and reservoirs. Many dams have lost their usefulness prematurely because the lake behind the dam filled with sediment from upstream, reducing its capacity. In an extreme case, denuded mountain sides may cause landslides, cutting roads, burying villages and damming rivers, with the possibility of later catastrophic flash floods downstream when the dams finally break.

**Endangered Species**

The problem of the conservation of nature is particularly critical on mountains where limited populations may be particularly vulnerable to over-exploitation or changing environmental conditions. High altitude species may have be restricted to small mountain areas, and have nowhere to go if their habitat is damaged.

While a number of countries have made great efforts in setting aside protected areas, the needs far exceed the means. Visitor impacts need to be managed carefully to avoid degrading the fragile mountain environment and losing the species for which protection was intended.

**Plant and tree cover**

Another major environmental concern for the future of mountains is the maintenance of plant and tree cover where the growing season is short, growth very slow, and damage to the land takes a long time to heal. This contributes to many subsidiary problems such as flooding, soil erosion, and loss of habitat for endangered species mentioned above. While many countries have tree replanting programmes, these have often not restored natural mountain communities but are aimed at commercial timber production.

**Land Use and Land Tenure**

Mountains often have conflicts between uses in limited accessible areas. Space for construction is limited, leaving villages with little room to expand. Land suitable for agriculture and animal pasture may be scattered and not easily accessible. The problems are accentuated by such things as tourism development. This requires comprehensive planning and careful allocation of land to the most appropriate use or combination of uses.

**Climate change**

Climate change is becoming a major challenge for mountain areas, as they are particularly susceptible. Warmer temperatures may mean less snow and more rain and flooding in winter, and drier summers. Species may shift to higher altitudes, and the highest mountain species may have nowhere to go and become extinct. The thawing of mountainsides that were formerly frozen all year round may destabilize slopes and produce serious rockfalls. Glacial lakes may fill to overflowing, burst and produce catastrophic flash floods.

**COMMON ENVIRONMENTAL CONCERNS**

The above problems are the most widespread in their impacts within most mountain areas, and thus rank first in priority. Another group of concerns affect some important mountain areas. They are frequently given high priority at a national level.

**Transport**

Transportation is always a challenge in mountains. In rural areas, walking and pack animals may still be the primary form of transport, making it difficult to bring goods into the villages and to take products to market. Roads and railways are expensive and difficult to build up steep mountain valleys. Tunnels and bridges are often necessary. Heavy snowfall, avalanches, landslides and floods may block the roads. Communities may be totally isolated. Helicopters may have to be used in emergencies.

**Human Habitat**

There are also problems of the human habitat in most mountains, particularly involving housing and sanitation. House construction is difficult on sloping terrain and must be strong enough to resist winter snow and cold. It is not easy to provide mountain villages with collective sanitation, and wastes are easily washed into streams and water supplies.

**SIGNIFICANT LOCALIZED PROBLEMS**

A third group of environmental concerns are not as widespread as those above, affecting only a few mountains, but they are significant in the local areas affected.

**Tourism**

In some mountain areas, tourism is now replacing agriculture as the primary economic activity. While summer hiking and mountaineering have limited environmental impacts, winter sports such as skiing require construction of ski lifts and clearing of slopes which can seriously modify the mountain environment. The concentrations of seasonal populations of tourists can overstretch water supplies and waste disposal facilities, and require construction of hotels and other facilities that may only be seasonally occupied. The employment created for mountain inhabitants may also only be seasonal, but can help to maintain mountain communities that might otherwise be depopulated.

**Mining**

Mining is the most significant economic activity in some mountain areas with important mineral resources, and it is inevitably accompanied by serious environmental problems. These include the disposal of mine wastes, tailings and processing wastes, erosion problems and the pollution of rivers in mined areas, loss of natural habitat, and the abandonment of unusable wastelands once the mining has ended. While new mines today are generally subject to strict environmental controls, older mines and areas abandoned after earlier mining continue to present serious environmental problems.

**Domestic Waste**

One problem in mountains where transport is limited and the same watercourse may serve several communities is the safe disposal of domestic wastes, particularly human wastes and sewage. Treatment facilities are difficult to construct and may only reach a small population because of the terrain.

**SUSTAINABLE USE OF MOUNTAIN RESOURCES**

The above problems all contribute in one way or another to the most critical environmental issue facing mountains: the sustainable use and management of their limited resources. Population growth as such is not always the most important factor; many mountain communities have seen their populations decline through emigration. Nevertheless, human activities are leading everywhere to a gradual (or not so gradual) erosion in the resource base on which the local residents depend for survival. Since the limits to resources are much closer in mountain areas, there is less room for error.

It is clear that the solution of these problems of the environment and of sustainable resource use will require management skills and a good scientific understanding of the mountain environment. Unfortunately, skilled people and scientific infrastructure are sorely lacking in some mountain countries.

If the peoples of mountains are to ensure for themselves a satisfactory environmental future, they must take measures to reverse the steady erosion in their resource base and to stabilize their populations within the carrying capacity of their land and resources, even if this means modifying what they see as deeply held cultural values. They must increase efforts to restore damaged resources, and to achieve comprehensive management of different resource uses and development activities. This will be very difficult, as it requires questioning some of the development assumptions and goals copied from lowland areas. It is clear from the above list of environmental concerns that mountains require unique forms of development adapted to the limitations of the environment, and drawing as much from the traditional societies that successfully lived within those limits for generations as from the modern world.