

III. HUMAN INTERVENTION : LOW INTENSITY PHASE

To a great extent, the potential conditions of environmental risks or stability in the mountains become a reality once the natural system is exposed to human-induced perturbations. Though often seen as a difficult place for human habitation, and characterised by low population densities compared to the plains, the mountains have historically been centres of flourishing civilisations and have sheltered religious and political refugees during different times in history. Associated with the above, has been the unavoidable human interference with the natural ecosystems (Eckholm 1975 and Hewitt 1988). However, traditionally the communities that lived and multiplied in the mountains, acquired better understanding of the limitations and potentialities of mountain environments. Their survival and growth strategies exhibited greater sensitivity to ecological and economic interdependencies. They adapted to mountain conditions well enough to minimise environmental risks (Guillet 1983 and Brush 1988). The resource management systems and practices they evolved generally proved conducive to the operation of biophysical processes and flows that helped ensure environmental stability. These worked quite well under the situation of low demand on mountain resources. These resource management and production practices can be seen in terms of traditional measures often grouped under folk agronomy, ethno-ecology, ethno-engineering, collective sharing systems, and recycling practices. Instead of describing them individually, we may refer to their key implications vis a vis the environmental stability through generation of circumstances potentially influencing the operation of biophysical processes and flows. Annex Table 2 lists some of the traditional practices in response to specific mountain conditions.

Most of the traditional practices were low resource intensive, and were governed mainly by local needs and local capacities to extract the resources. Table 2 summarises some of the adaptation measures and their role in helping circumstances conducive to environmental stability. Accordingly, despite human habitation, inaccessibility imposed constraints such as isolation and closedness, necessitated diversification, local resource regeneration, balanced resource use, etc. Similarly, local demand and local capacities to extract resources being low, the pressure on resources remained low. Through local control of the local circumstances, pressure on resources was deliberately kept low through various measures of demand-rationing, including social - cultural sanctions, periodical outmigration, etc (Guillet 1983 and Hewitt 1988). These measures contributed in different ways to generate circumstances conducive to the operation of biophysical processes and flows which helped to maintain environmental stability.

Fragility and marginality, the two features of mountain habitats that made mountain environments most vulnerable to degradation and prone to slow regeneration, were handled by a two way adaptation process under the traditional systems. Firstly, through land extensive production practices and uses (e.g., pasture and forestry, instead of intensive annual cropping) and institutional regulations (e.g., through provision of common property resources), usage systems were adapted to the limitations of the resources. By implication, these measures helped in better regeneration, flexibility, and improved energy and material flows. On the other hand, through ethno-engineering measures such as terracing, water harvesting, community irrigation systems, etc, the fragile and marginal resources were upgraded, and this helped in environmental stability through increased resilience, regeneration, and improved natural flows.

Diversification, through spatially and temporally diverse but interlinked activities, has been one of the most important features of traditional resource use systems. At a macro-level, this is reflected through balanced land use involving provision of forest, pasture, cultivable land, etc and at a micro-level, this is reflected through diversified cropping systems and other features of traditional farming systems. This sort of diversification, besides matching the imperatives of resource characteristics, also met the diversified needs of mountain communities in the relatively closed or isolated context of their habitats. More importantly, in a variety of ways, this helped in the processes contributing to regeneration, flexibility, and regulation of natural flows.

An important component of the overall diversification of activities to respond to resource characteristics was the focus of traditional systems on harnessing and protecting 'niche' or areas and activities of comparative advantage for mountains. Since 'niche' served as an important basis for upland-lowland linkages and a means of surplus generation and exchange, its protection and development was part of the survival and growth strategies of mountain communities. Thus, because of the crucial importance attached to protecting 'niche' and the key role of local needs and local extraction capacities in determining the usage level of mountain 'niche' (be it potential for hydropower, minerals, or timber), the resources were generally not over-exploited. Hence the harnessing of 'niche' did not disturb the dynamic processes and flows of nature.

All the above features of traditional resource use systems or farming systems are part of the human adaptation mechanisms in the mountain areas and have been evolved and inherited by mountain people through the centuries. These adaptations involved various other practices, such as product recycling, flexible consumption patterns, transhumance, and migration, which directly or indirectly facilitated regulation of pressure on resources and by implication proved conducive to the operation of biophysical processes for environmental stability. However, as indicated earlier, most of the traditional adaptation measures as responses to imperatives of mountain specificities were evolved in the context of low demand pressures on mountain resources. Low pressure, in turn, was the product of a smaller population and subsistence-oriented, local resource-centred agriculture as the dominant activity of mountain areas. Trade

Table 2: Mountain Specificities, Human Adaptations and Implications for Environmental Stability/Risk

Mountain specificities and features of adaptations ^a	Implications (circumstances) potentially conducive to environmental stability			
	Regene- -ration	Variabi- -lity	Resili- -ence	Energy/ -material flows
<p><u>Inaccessibility</u> (Isolation, closedness):</p> <p>Local (diverse) resource-centred production systems</p> <p>Local demand-driven, local capacity-based (low) resource extraction</p> <p>Limited external reliance/support, compelling rationing of demand and resource use; social sanctions</p>		X		X
<p><u>Fragility and Marginality</u> (Limited and 'inferior' options, high vulnerability to disturbance):</p> <p>Land extensive production systems (annual perennial linkages); sanctions against overuse (common property resources), etc.</p> <p>Resource upgrading (terracing, irrigation), collective sharing systems</p>	X	X	X	X
<p><u>Diversity</u> (Potential for multiple interlinked activities):</p> <p>Diversified farming system, spatial-temporal linkages of land-based activities, food systems and other demands tuned to diverse supplies</p>	X	X	X	X
<p>'Niche' (options/possibilities with comparative advantage):</p> <p>Local need - and capacity-based low and regulated extraction</p> <p>Diversified and interlinked activities</p>	X	X		X

and industry (cottage industry) were largely linked to local resources ('niche') and agriculture. Furthermore, owing to limited external linkages, outside demand or market signals could not exert undue pressure on local resources. Besides low demands, non-availability of means (technologies and infrastructure) for large-scale extraction of mountain resources also prevented undue disturbance to the mountain environment through human interventions. However, the land extensive, non-extractive features of the traditional systems are not compatible with the resource use intensification forced by rising demands on mountain resources as elaborated below (Jodha 1991).