

VII. SOCIOECONOMIC VULNERABILITIES

So far, we have focussed on environmental changes and risks largely in terms of disturbance to biophysical processes underlying the flow of environmental products and services used by human society. Disruption of the above flows through cumulative and, to a limited extent, systemic types of environmental changes was highlighted. Occasionally, we alluded to the impacts of these disruptions on the survival and growth strategies of mountain communities. However, these issues need more systematic treatment. Hence, a need to comment upon the socioeconomic and socio-cultural vulnerabilities of mountain communities to risks associated with environmental changes. However, for doing so we will focus on environmental resources and their impacts on socioeconomic variables (including opportunities and human decisions), rather than on the basic biophysical processes determining the flows and stock of environmental services.

The socioeconomic vulnerabilities, at the operational level, are reflected through reduced range, viability, flexibility, dependability, and pay-offs of production and resource use options to satisfy human needs. In the mountain context, on the technology side, this may happen due to break down or infeasibility of diversified, resource regenerative practices as well as degradation of natural resource base. On the institutional side (where institutional change may take place in order to adapt to the changing biophysical opportunities), slackening of resource management/protection systems, reduced resource accessibility, reduced range and quality of options, marginalisation of collective sharing systems, etc will manifest the extent of socioeconomic vulnerability.

While discussing the indicators of emerging environmental risks in mountain areas (Table 4), such changes were already commented upon. However, some of these changes are impacts of disruption in environmental and natural resource situations, while others could be causes of such disruptions because the socioeconomic adjustments to environmental change may cause further changes in the environmental situation at second or third level downwards.

The mechanism begins with increased scarcities due to internal demands or external pressures on water, vegetation, and soil resources (as indicated by capital letters in Table 6). It results in direct over-extraction or promotion of adjustment measures that are more resource extractive. Each of them contribute in different ways to increased socioeconomic vulnerabilities in terms of reduced range and

Table 6: Environmental Changes and Socioeconomic Impacts/Vulnerabilities in Mountain Areas^{a)}

Environmental changes and underlying factors or responses to change	Socioeconomic impacts/vulnerabilities			
	Unfeasibility of traditional production systems, regeneration, resilience	Reduced range/quality of options, control, access to resources	Increased external dependency, unequal exchange, subsidy, marginalisation	Reduced collective sharing systems, low resilience, cultural breakdown
Physical degradation of land resources (W,S) ^{b)}	x	x		
Reduced variability, flexibility of production factors (V,W)	x	x	x ^p	
Increased 'ecological' subsidisation through chemical, physical, biological inputs (V,W)			x ^p	x ^p
Vicious circle of resource degradation overextraction-degradation (W,S)	x	x	x	
'Niche', technology, market induced over-extraction, reduced resource availability/access (V,W,S)		x	x ^p	x ^p

- a) Details presented in the table largely relate to agriculture dominated by stagnant production systems; but the items indicated by (p) apply to progressive agricultural areas also.
- b) The capital letters stand for worsening of the situation caused by internal scarcities and external pressures with regard to: W = Water, V = Vegetation, S = Soils-resources likely to be affected by environmental degradation.

quality of options, time-tested traditional resource management systems, etc. Table 6 gives an indication of these possibilities. These possibilities relate mainly to the predominant activity of mountain communities, i.e., agriculture. However, such formulation can be presented with respect to other activities such as tourism, trade, as well as macro-economic interventions.

Vulnerabilities to 'Systemic' Change

The argument on linkage between 'cumulative' and 'systemic' changes can be easily extended to socioeconomic vulnerabilities to environmental risks in mountain areas. The involved issues can be discussed in the following contexts.

First, to the extent that global warming-induced changes are likely to have more severe impacts on poor and marginal areas, i.e., areas with a higher degree of present crises (for whatever reasons), the mountain regions and communities with a current status of environmental degradation and associated socioeconomic disruptions may face a still worse situation with the potential changes associated with global warming. This will be due both to erosion of their capacities to withstand the future crises as well as aggravation of resource extraction, imbalances, and scarcities.

Second, impacts of the off-site factors, such as external demand-induced resource extraction and marginalisation of mountain areas and communities, are likely to be aggravated with systemic environmental changes. In particular, one may think of increased external pressure on water, space, and vegetation (including bio-diversity) resources of the mountains. The scale, and technologies to be employed in this process of resource extraction to meet the needs of off-site communities may further disrupt the survival and growth strategies of mountain communities.

Possible Response : Dual Purpose Strategies

If our understanding of linkages between cumulative and systemic changes is correct, the measures against the above stated socioeconomic vulnerabilities can begin with the strengthening of the mountain communities' ability to withstand the problems created by current resource degradation and environmental changes. This, in turn, calls for steps that enhance resource use intensification with resource regeneration and conservation. In other words, environmental stability and productivity in the current context has to be achieved to enable people to withstand impacts of systemic changes in the future. Accordingly, technological and institutional steps directed towards enhancing the health and productivity of environmental resources (land, water, vegetation) in the current context will also help in their long-term sustainability. By implication, such steps will control the cumulative type of changes and (due to their essential linkages) will also control systemic changes. This, in a way, is the essence of 'dual strategies' directed simultaneously to systemic and cumulative changes as well as 'regional' and 'global' environmental changes (Jodha 1990c). The scientific and institutional prescription against global warming and its impacts (IPCC 1990) will have greater chances of success if they are integrated into dual purpose

strategies. This will reduce the role of uncertainty of modelled scenarios in obstructing evolution of workable and readily acceptable strategies against systemic changes.

This can be elaborated. One of the principal reasons for such inaction is the degree of uncertainty associated with modelled change scenarios which, in turn, causes other problems, such as the varying perceptions of different nations on potential impacts of environmental changes and sharing of cost and gain of strategies against it. In the broader context of uncertainty-induced inaction against environmental change and associated risks, an understanding of potential linkages between cumulative changes and systemic changes can offer certain useful leads (Jodha 1990c). As the severity of the impacts of cumulative changes is likely to be enhanced through systemic changes and vice versa, measures against any one of them would help reduce environmental risks. Since the cumulative changes are more certain and already witnessed as a reality, measures against them are less likely to be obstructed by the phenomenon of uncertainty. Similarly, as the spatial context of cumulative changes is more concrete (e.g., deforestation in the Himalayas), the response measures against them (unlike systemic changes) would not be constrained by lack of any regional disaggregation of the problem. Finally, since cumulative changes are a part of the current problems in the developing countries, any measures against them would neither need intensive lobbying and consensus building (as tried against global warming) nor any diversion of resources away from the current problems of poverty and underdevelopment.

Finally, if designed as dual purpose strategies, the gains from such measures (e.g., management of forest, land, and water resources) may strengthen people's capacities to withstand environmental risks associated with both cumulative and systemic changes (Jodha 1990c). Accordingly, a search for dual purpose strategies should be the focal point of approaches to environmental management in mountain areas.

The dual purpose strategies against environmental risks cannot be confined to the supply side-issues of the problem. In other words, no measures designed to regenerate, recycle, and diversify resources (for environmental stability) will help in the long run unless pressure on resources and associated extraction technologies are also managed.

The emerging indicators of cumulative and systemic changes in the ultimate analysis are consequences of mismanagement or free play of basic human driving forces, such as competitive and inequalitarian systems of resource exploitation, unequal terms of exchange, population growth, etc. In the face of these forces, no breakthroughs in resource regeneration or productivity, or growth will help in the long run. What has been stated above applies to the world economy, in general, but this is more so in fragile resource zones, such as the mountains, where the demand-induced resource extraction reaches its limits too soon. Hence, the solution to environmental risks in the mountains is closely linked to the management of internal and external pressures on mountain resources. In this context, a few important operational leads could be provided by better understanding of upland-lowland linkages and the side effects of the integration of mountain economies with the mainstream economies through market, infrastructure, and administrative processes (Jodha et al. 1990).

Table 1: Indicators of the "Skewed Perspectives" on Global Environmental Changes^{a)}

Elements prominently focussed	Elements under emphasised
<p>'Systemic' type of change:</p> <p>Focus on biochemical variables and their interaction processes relating to the functions and operation of geosphere and biosphere systems of the earth.</p> <p>'Geocentric perspective':</p> <p>Focus on physical dimensions, typically in the natural science framework; concentration on geobiological variables and their complex interaction patterns, with little direct incorporation of human dimension of changes and change-processes.</p> <p>Other associated aspects:</p> <p>Emphasis on long time horizon (decades/centuries), inter-generational issues; focus on terminal impacts involving selected variables (e.g., sea level, and temperature rise, shift of climatic zones, etc) affecting fundamental equilibrium of world system and atmosphere; analytical methods and material used involve high degree of complexity and sophistication, information on several unknowns, limited transparency (for uninitiated ones), multiple uncertainties, and conjectural nature of predictions.</p> <p>Advocacy and action:</p> <p>High 'scarce and noise' potential of issues covered, (e.g., doomsday predictions); approaches to abate/adapt to changes: obstructed by uncertainty of change scenarios, induce higher discounting of the potential options, inject vagueness about gains and sacrifices and create more panic and debate than concrete action.</p>	<p>'Cumulative' type of change:</p> <p>Localised and widely replicated changes in different variables and process of resource use, (when accumulated) influence the global systems.</p> <p>'Anthropocentric perspective':</p> <p>Primacy of nature-society interactions with focus on their importance to the society; potential mechanism for understanding and handling 'cumulative changes' (with some possibility of influencing impacts of 'systemic changes'.</p> <p>Other associated aspects:</p> <p>Sensitivity to both intra-generational and inter-generational issues; analytical approaches simpler and oriented to integration of change processes in current problem-solving mode; predictions, action/advocacy focus on short or medium planning horizon, greater ease and possibility of associating causes, consequences of and responses to change; greater possibility of integrating geocentric and anthropocentric perspectives.</p> <p>Advocacy and action:</p> <p>Possibility of evolving options within the received (and modified) framework of handling current crisis situations in local contexts; greater scope for clearly associating cost and benefits, greater certainty of potential options and their easy acceptability to decision-makers; possibility of dual purpose options to handle current and future 'impacts'.</p>

a) Source: Table adapted from Jodha (1990c)

For various issues and examples which could fit into the following grouping of perspectives see Price (1990), Turner et al. (1990), Flavin (1989), Jodha (1989), Glantz et al. (1988), Clark (1985), Chen et al. (1983), and Kasperson et al. (1990).

Table 2: People's Traditional Adaptation Strategies in Response to Mountain Specificities

Adaptation Measure	Mountain Specificities ^{a)}				
	I	F	M	D	N ^{a)}
Diversification and Self-provisioning:					
o Spatially, temporally interlinked activities	x	x		x	x
o Local resource-focussed recycling, self-provisioning		x		x	x
o Scattered settlement patterns	x			x	
Folk Agronomy:					
o Annual - perennial plant complementarities (farming-forestry linkages etc)		x	x	x	
o Cultivars of varying attributes		x	x	x	
o Fallowing, rotations, topo-sequencing, intercropping	x	x	x		x
Ethno Engineering:					
o Slope management (terracing, etc.)		x	x		
o Protective vegetation, contour farming		x	x		
o Traditional irrigation/drainage management			x	x	x
o Small-scale transport logistics (ropeways, trails, donkey tracks, etc)	x				
Collective Arrangements:					
o Common property resources		x	x	x	
o Social regulations for use/protection of fragile resources		x			
o Community irrigation systems, etc			x	x	x
o Crisis period sharing systems	x	x	x		
Upland-lowland Linkages:					
o Petty trading in specialised mountain products (with high value, low weight etc).				x	x
o Periodical migration	x				
o Transhumance	x	x			
o Externally planned extraction of mountain 'niche'	x	x			x

Source: Table adapted from Jodha 1990a.

The following letters stand for the respective mountain characteristics: I = Inaccessibility, F = Fragility, M = Marginality, D = Diversity, N = 'Niche'.