

Chapter 3

Land Degradation

Causes

It is well known that the most serious forms of land degradation in the NWHRI are accelerated wind and water erosion, soil loss, high runoffs, depletion in the quality and productivity of lands, and land uses that are removed from land-capability optimalities. The underlying causes can be traced to a complex web of social, economic, and institutional problems that arise both from within the mountain regions and outside. They include the combined effects of the meeting of their subsistence needs by hill people, land distribution, fragmentation, tenure/titling problems, low productivity, rising human and animal population pressures, and severe competing demands from users of land. The competing uses, apart from forestry, agriculture, and grazing, can be urbanisation, industries, roads, multipurpose projects, rural settlements, tourism, etc. Land shortages and difficulties experienced by mountain communities in meeting their subsistence needs lead to non-sustainable management practices. By and large, a typical hill farmer is aware of the causes, processes, and results of resource degradation

through erosion. However, restoration efforts often involve long-term measures that do not add to the upland farmer's immediate income (Dent 1996). A broad listing of the causes of land degradation follows.

- Rapid increase in human and animal populations
- Extension of cultivation to marginal and steeply sloping lands that are easily erodible
- Overgrazing of pastures and forest floors (maintenance of livestock is blended with farming and other agro-based activities)
- Unconsolidated, fragmented land holdings that make conservation management difficult.
- Defective terracing
- Soil problems: hill soils are formed by various kinds of rocks under sharply ranging temperatures. These soils are, generally, shallow and gravelly. Deeper soils are uncommon and occupy a small percentage of hill areas. Hill soils' main limitations are their highly porous nature, low retention of moisture and

nutrients, acidic quality and moderate to severe erodibility.’

- Absentee landownership
- Indiscriminate mining and quarrying, and absence of conservation measures in such areas
- Unscientific construction of roads, dams, buildings and other engineering projects
- Urban expansion
- Deforestation and degradation of forests and diversion of forest lands for non-forest purposes (This distorts the forest–agricultural land ratio, which is often already adverse.)
- High fuelwood demand
- Improper agronomic practices and unsuitable crop rotations
- Conflicts between tenancy and open-access resources
- Forest fires
- Erosion and scouring caused by fast-flowing rivers and streams
- Landslides and land creeps
- Floods, fires and earthquakes

There can be other causes, too: militancy in Kashmir has led to large-scale deforestation; increasing tourist/pilgrim traffic and mounting number of expeditions and group treks; illegal tree-felling accompanied by wood-smuggling; over-extraction of herbs and medicinal plants; and multistoreyed building construction on steep and unstable slopes.

Land degradation is a serious problem in all three subregions of the NWHRI. The Jammu and Kashmir Land-Use Board estimates that 1.4 million ha are degraded. In Himachal Pradesh, 35–40 per cent of the geographical area is degraded. In the Uttar Pradesh hills, nearly 30 per cent is degraded. These figures may vary by percentage points, but they convey the dimension of the problem.

Degradation is not a universal phenomena in the NWHRI. Many areas have retained

their protected form; many have been recovered through human endeavour. However, these lands are by nature fragile and marginal. The incidence of degradation is substantial and, in many places, it is certainly on the rise. What is more, even in those areas where signs of damage are absent or marginal, multiple and rising pressures are at play and, unless due care is exercised and interventions are mobilised in time, damage may become acute, even irreversible. What is needed is a set of long-term programmes backed by sound land-use policies and strategies. Such programmes must be centred on community participation. Ultimately, land and water resources can be conserved and rehabilitated only by those who make their living from them.

In 1986, Sunder Lal Bahuguna, an environmentalist, walked 2,500 km across Jammu and Kashmir, Himachal Pradesh, and the Uttar Pradesh hills. He writes (Bahuguna 1986):

‘in the Chenab Valley in Doda district of Jammu and Kashmir we had seen a large number of dead and snow-damaged trees... Though there has been some restraint on green fellings in Himachal Pradesh, the demand for apple packing cases is so high that, everywhere, on the roadside, logs could be seen. The number of dead and dying trees must be very high as heaps of sleepers were seen. In Uttar Pradesh, while a moratorium on felling of green trees stands imposed, heaps of sleepers near Thadujab and other places on the banks of Tons tell the tale of organized plunder of forests a common feature in the catchments of B hagirathi, Alaknanda, Pindar, Ramganga and Kosi. In remote areas, where nobody is to check, the plunder continues unabated’.

In Jammu and Kashmir, in connection with the preparation of an integrated watershed project, the common-property land resources’ situation in two small watersheds

was studied (Development Alternatives 1989). Both watersheds exhibited land degradation, heavy soil erosion, and soil depletion. In slopy areas, signs of excessive runoff were visible in the form of rills and gullies. Common lands were highly eroded, and degraded areas were scattered all over. Fuelwood deficiency was marked. Overgrazing, poor management, and overexploitation had resulted in heavy pressure on common-property land resources. As a result people had begun to use reserve forests for meeting their requirements.

Erosivity and Runoff

The All-India Soil and Land Use Survey Organization has been carrying out rapid reconnaissance surveys of river catchments for more than two and half decades—including important watersheds in the NWHRI drained by rivers such as the Sutlej, Beas, Thein, Ghaggar, Giri-Bata, Upper Yamuna, Pohru, Alaknanda, Bhagirathi and Ramganga. An analysis of their findings shows that, of 3,033 subwatersheds surveyed in the NWHRI, 1,643 (54%) were found to fall in very high or high priority categories where urgent soil and water conservation measures were considered necessary. The area covered by highly erosive subwatersheds was found to be 52 per cent of the total area surveyed (AISLUS1997).

Sedimentation

There are many projects in the NWHRI for generation of power and creation of irrigation facilities. Valdiya says:

'The reservoirs formed behind the dams are being filled at a rate three to five times faster than estimated by the planners so that their effective lives are considerably reduced. The faster rate of sedimentation implies a quickened pace of erosion in the catchment area—about 100 cm per 1,000 years on average, compared to 21 cm per 1,000

years in the past 40 million years'.

In the Bhakra dam, actual sedimentation rates were nearly 50 per cent higher than had been assumed. In the Kalagarh dam in the Uttar Pradesh hills (completed in 1976), assumed sedimentation rate was 4.2 ha m/100 sq.km while the observed rate in 1979 was 18.29 ha m/100 sq.km.

Water Springs

A consequence of deforestation and attendant erosion is the damage done to undergroundwater resources. A survey of the Gaula River catchment in Nainital district carried out in the 1980s revealed that 45 per cent of the springs had reduced yields or gone dry, the extent of decrease in discharge ranging from 25 to 75 per cent (Bartarya 1988). Another feature in Nainital district is the number of drinking-water schemes (about 60–70) that have become defunct because of the drying up of the source or reduction in discharge.

Mining/Quarrying

Severe damage is caused by mining and quarrying in hill areas. The mining of slates in the Dharamsala areas of Himachal Pradesh has caused much degradation. Mountain slopes have been defaced. The hills surrounding the Khanigra mines have been scarified and are covered with slate debris. The entire area is barren and rugged. There is no vegetation to support local livestock. Debris falls into local streams and disrupts the flow of water. On the Mussoorie hillface, before 1947, only four areas had been leased for limestone quarrying. By the 1980s, the number was up to 104. Damage to hill slopes was extensive. Water regimes were seriously affected. Debris and dust made life for people living in the Doon Valley miserable.

In 1984, a public interest litigation petition was filed by an NGO and it took four years before the Supreme Court finally put a stop to all mining in this area.

Landslides

The Himalayan slopes are unstable, and landslides are a major problem. Each year, large-scale damage to life and property is caused by rockfalls, slides, and creeps. In Nainital district, 0.73 landslips occur on each kilometre of land (Sharma 1996). Each year 550 cubic metres of debris per km of road was being produced by landslides and rockfalls in the central Himalayas (Singh 1992). In 1998, high rainfall in the Uttar Pradesh hills caused extensive landslides in Kumaon and Garhwal. Twenty-three villages were wholly or partially destroyed by landslides, and this resulted in over 100 deaths. A large landslide dammed the Madhmaheshwari River creating danger for downstream areas.

Impacts on Water Bodies

There are many examples of serious deterioration of water bodies in the NWHRI. The Dal Lake of Kashmir has suffered drastic shrinkage in area, eutrophication, and ecological degradation. The lake shrunk from 35.2 sq.km. at the end of the eighteenth century to 15.4 sq.km. in 1990. Among the causes of depletion are large-scale encroachment, high level of sedimentation, and the rising incidence of 'floating islands'—small bodies of soil and vegetation floating on the lake—that have been converted into land. Silt from Telbal Nala is said to have converted 9.5 sq.km. into land in the last few decades. Another example is Nainital Lake in Kumaon where sedimentation has adversely affected ecology. Nainital has a history of unstable slopes and massive landslides.

Deforestation and Changes in Forest Cover

Deforestation has occurred in the entire NWHRI. The 'oceans of forests' observed by travellers in the nineteenth century are seen no more. During colonial times, forests were used ruthlessly for commercial and revenue purposes. The need for quick-growing industrial species gave rise to monocultures. Diversity was reduced. People's access was restricted. This caused resentment and resulted in large-scale incendiarism in Kumaon. The contractor system inflicted severe damage. The pressure of human and animal population took its toll. Diversion of forest lands to non-forest uses was high until the Forest Conservation Act 1980 put a stop to it. Encroachments also increased. Undemarcated and community forests suffered for want of good management. All these factors, which have a bias in favour of industrial/commercial uses rather than protective ones, aimed at meeting the fuel, fodder, timber, and non-timber forest product needs of the hill people, have contributed to deforestation, degradation, and qualitative changes in forest cover.

Roads and Buildings

Unscientific construction of roads has caused extensive landslides and contributed to deforestation and degradation of mountain gradients. For each linear kilometre of mountain road, ten small to medium landslides occur as a direct result of slope instability caused by road construction (Tejwani 1987). Along the Tanakpur–Tawaghat highway in the central Himalayas, 411 cubic metres of debris was produced per linear kilometre of road per year (Messerli and Ives 1989). Construction of buildings, especially large multistoreyed structures (these can be seen prominently in Shimla, Mussoorie,

Nainital, etc) also create severe impacts. Excavation debris poses serious environmental problems. It destroys vegetative cover, prevents regeneration, damages vegetative slopes, and accelerates erosion.

Forest Fires

Forest fires, which may be natural or deliberate (or accidental), are extremely harmful. They cause accelerated erosion, hamper plant regeneration, destroy valuable vegetative growth and decimate wildlife. In Uttarakhand alone, the incidence of forest fires is quite substantial. In 1995, 2,272 fires affected 937 sq.km. of forest under the control of the Forest Department (Mehta 1996). If *van panchayat/gram panchayat* forests were included the number of fires would be greater. A tendency that is both remarkable and worrisome is that public cooperation in the prevention and control of fires is on the decline. This is perhaps a reflection of the recent alienation of local people from forests. This 'estrangement' is sought to be reversed with the adoption of the joint forest management policy.

Overgrazing

Tremendous biotic pressure on pastures and forest floors is caused by overgrazing. In the NWHRI, grazing loads exceed yield levels by factors ranging from two to four. Overgrazing has many adverse impacts: gully formation on cattle tracks, inhibition of growth of grasses, and declining productivity.

Natural Causes

There are also natural causes of land degradation such as floods, earthquakes, glaciers, and snow avalanches.

Backward Linkages

In Table 7, an attempt has been made to identify the backward linkages to causes of some types of land degradation common in the NWHRI: natural, policy related, and non-policy related.

Table 7: Land Degradation and Backward Causative Linkages			
Types of degradation	Backward linkages		
	Natural causes	Policy-related causes	Non-policy-related causes
DEFORESTATION AND DEGRADATION OF FOREST LANDS	Earthquakes Landslides caused naturally Floods Natural forest fires	Historical policies of colonial times Emphasis on revenue earning Forest declared as public lands People's access restricted Contractor system Shift to utilisation of forests to meet industrial and commercial needs Grow more food campaigns that diverted forest lands to agriculture	Increasing human population that increased demand for fuel, fodder, timber and non-timber forest products Increasing animal population Overgrazing Tourism Transhumance Demand of more land for agriculture Encroachment Landslides caused by mining, road construction, etc
RANGELAND DETERIORATION (DEGRADATION OF PASTURES AND FOREST FLOORS)	Natural disasters Long-term climate deterioration Lowering of fertility levels Low herd diversity	Uncertain grazing policies Unregulated transhumance Lack of policies for controlling animal pressures and cattle numbers Poor support of research Contradictions between privately-owned livestock and communal lands (rangelands) Non-participatory rangeland and forest floor management	Overgrazing and 'free riding', high stocking densities Non-compliance of closure rotations Inter-state movement of pastoralists without limitation on animal numbers Non-adoption of stall-feeding Transhumance Pastures are commons; seeding, fertilizing and weeding need proper institutional arrangements that are missing. Trekking in large groups Increase in human and animal populations Over-exploitation of herbs/ medicinal plants as well as fuel/fodder trees
SOIL EROSION	Operation of tectonic and gradational forces Reduced biomass cover and forest degradation Flash floods and rushing water courses Scouring by river action Landslides	Absence of scientific and appropriate land-use policies Non-participatory land/water management Non-enforcement of policies and laws Subsidising of faulty land use, e.g., soil conservation subsidies even for steep-slope untterraced agriculture	Faulty land-use practices Steep-slope agriculture Unscientific agronomic practices, e.g., planting of crops along slopes Faulty terracing Use of unlined water courses for draining or transporting water Unscientific road construction Disposal of excavation debris Mining and quarrying Overgrazing Shifting cultivation
SPRING WATER DEPLETION	Reduction in biomass cover Exotic afforestation activities	Faulty pricing of water: scarcity value not reflected in price Community participation in water management inadequate or missing	Poor land-management practices Deforestation, illegal felling Reduction in broad-leaved tree cover