

Climate Change and Himalayan Ecosystem – Impacts, Monitoring, Vulnerabilities and Adaptation

Integrated Research and Action For Development

“Climate Change and Himalayan Ecosystem – Impacts, Monitoring, Vulnerabilities and Adaptation” is a proposed project of the Integrated Research and Action for Development, which will be undertaken in collaboration with G.B.Pant Institute of Himalayan Environment and Development and H.N.B. Garhwal University, to study impact, vulnerability and adaptation due to climate change in the Himalayan ecosystem.

Climate Change

Climate change is one of the most important global environmental challenges and the many types of impacts are needed to be understood and assessed, vulnerabilities needed to be addressed, while adaptation strategies have to be developed. The Himalayan ecosystem not only provides mountain goods and services but also biodiversity, community diversity and cultural diversity.

Slide

Geophysical impacts

Monitoring of glacier retreats have shown that, due to global warming and climate change, snout recession rates of some glaciers in Himalayas are as follows:

Slide 7 Caption for table: The monitoring systems for glacier retreat due to extreme events and disasters show snout recession rates of some glaciers in the Himalayas.

Glacial lake outburst floods (GLOF)

Slide 8

A list of GLOF events recorded in Nepal slide 9

Other geophysical impacts include: landslides and avalanches; change in rainfall and snowfall; frequency of storms and fog; and floods and droughts.

Biological impacts

There has been a change in vegetation, with the present distribution of species in high-elevation ecosystems being projected to shift to higher elevations; and the result is rapid reduction of alpine

plants growing at high-altitudes. Besides, weedy species with a wide ecological tolerance have an advantage over others.

Biodiversity

The Eastern Himalayan region is considered to be one of the mega-biodiversity hotspots of the world. Due to increase in temperatures, change in vegetation, rapid deforestation and scarcity of drinking water, habitat destruction and corridor fragmentation may lead to be a great threat to extinction of wild flora and fauna. A recent study suggested that a quarter of land animals and plants, altogether 1 million species, could be extinct by the middle of this century.

Forest cover

Huge anthropogenic pressures have led to destruction of mountain forests. In the Himalayan mountain systems, the timberline/tree-line and snowline represent two most recognizable biological boundaries. Currently, tree-line studies outside India focus on changes in stand density, recruitment and growth patterns. Global warming associated with upward migration of altitudinal boundaries and consequent change in snowline position and its biota is an important factor for initiating long-term monitoring in the Himalayas.

Major forest types include sal (*Shorea robusta*), mixed sal, pine (*Pinus roxburghii*), pine-mixed broadleaf, mixed oak (*Quercus* spp.) and cupressus (*Cupressus torulosa*). The process of fragmentation has been studied through changes in forest area and biomass and it has been noted that there has been a sharp decline in biomass, though forest area has marginally reduced, between three and five per cent. Stocking density has also declined substantially and forest area with crown cover greater than 60 per cent, declined from 736.32 ha to 292 ha between 1973 and 1989, indicating the intensity of human interference.

Agriculture and horticulture

Agriculture is highly dependent on weather and changes in global climate have a major effect on crop yield and food supply. Weather also impacts soil and plant growth; and animal growth and development. Horticulture is an important source of income of the Himalayan people. Irregular rainfall and snowfall; change in climatic condition; and rising temperatures affect fruit production. The quality and quantity of tea production is also affected by irregular rainfall.

Socio-economic impacts

Rangeland degradation

Most semi-arid lands in Asia are classified as rangelands, with a cover of grassland or scrublands. Though about 82 per cent of the land area is used for agriculture, these areas are mainly low-productive pastures. An increase in temperature of between 2°C and 3°C, combined with reduced precipitation, is expected to reduce the productivity of grasslands by between 40 and 90% (Smith et al. 1996). Rangelands in Nepal have been subject to degradation in recent years (NBAP, 2000). Climate change is likely to represent an additional stress to rapid social change in many of Asia's rangelands. Rangelands are an important fodder source of the hill people and degradation affects the hill economy.

Flood and Drought

Glacial lake outburst floods (GLOF), excessive rainfalls lead to severe flood, causing damage and destruction of property, lives and crops. The River Brahmaputra and the River Indus have the same source, which is the Mansarower Lake in Tibet. The precipitation over the River Brahmaputra's catchments area is much higher than that of the River Indus since the monsoon winds are not restrained by high mountains. The River Brahmaputra has received repeated flood flows for the last few years, while the River Indus has been nearly dry. As Himalayan glaciers irreversibly melt, there is increased flooding in glacier-fed rivers and followed by decreased water resources, as glaciers disappear. The region's agriculture and power generation are dependent on the freshwater supply fed by the discharges of the Himalayan glaciers. In the River Ganga, loss of glacier melt water would reduce July-September flows by two thirds, causing water scarcity for 500 million people and 37 per cent of India's irrigated land.

Water quality, availability and health hazards

Several scenarios of climate change have been projected for the Himalayas. Climate change will cause changes in plant species and habitat. Changes in land use and vegetation are, and will be, a continuing due to natural and anthropogenic pressures. These changes will have impacts on humans and their health. Flash floods (GLOF) cause severe physical injuries, even death, and vulnerable groups such as the poor, women, and children suffer the most. To a large extent, communities in rural areas suffer from floods. Hospitals are far away and this aggravates damage to humans. Infectious diseases transmitted by insects and vector-borne diseases such as malaria, yellow fever, and schistosomiasis will affect more people, as these diseases are sensitive to temperature and change in land use.

Gender

Because of women's marginalized status and dependence on local natural resources, their domestic burdens are increased, including additional work to fetch water, or to collect fuel & fodder. In some areas, climate change generates resource shortages and unreliable job markets, which lead to increased male-out migration and more women left behind with additional agricultural and households duties. Poor women's lack of access to and control over natural resources, technologies and credit mean that they have fewer resources to cope with seasonal and episodic weather and natural disasters.

Adaptation

Successful adaptation must be accomplished through actions that reduce vulnerabilities of poor people, as they are dependent on ecosystem goods and services for their livelihoods. There is a need to restore a balance between economic interests and ecological imperatives. An integrated approach is needed to identify multi-stakeholders and participatory processes for the selection, implementation and appraisal of adaptation strategies. It is assumed that national governments, multilateral and bilateral development agencies and banks, the private sector, the scientific community, civil society and other stakeholders will participate in the implementation process.

Capacity building

Capacities of communities have to be enhanced and strategies needed to be developed for adaptation to climate change. Only these can reduce future vulnerabilities. The project intends working in a site at Uttarkhand, where strategies for conservation of endangered flora and fauna are being developed. These will include cultivation of medicinal and aromatic plants; herbal cosmetic products; and collection of resin and other NWFPs. Information is being collected on consumption of fuel woods, collection of fodder and livestock. Traditional indigenous knowledge, that can avert climate change impacts are being examined along with traditional art and craft based livelihoods and income generation through involvement of local people in eco-tourism have to be implemented..

Conclusion

The objective of the project is assessing impacts – geophysical, biological and socioeconomic; identifying vulnerable groups, ecosystems and endangered flora and fauna; identifying key adaptation methods, practices and solutions including preservation of livelihoods; and designing monitoring systems for geophysical, biological and socioeconomic impacts of climate change.