



# CLIMATE EXIGENCY- AN ASSESSMENT OF NATIONAL MISSION FOR SUSTAINING HIMALAYAN ECOSYSTEM

AIMAN UROOJ<sup>1</sup>, VATSAL CHAUDHARY<sup>2</sup>

<sup>1</sup> Master of Arts in Political Science, Department of Political Science, Ramjas College, University of Delhi, Delhi-

110007, India

<sup>2</sup> Research Scholar, Department of Political Science, Vardhaman College, MJP Rohilkhand University, Bareilly-243006, India

**Abstract:** The National Mission on Sustaining Himalayan Ecosystem recognises that the Himalayas are a distinctively ecosystem, prerequisite for their services but vulnerable to climate change impacts. Given the multiple stakeholders in Indian Himalayas and the off-site nature of ecosystem services, a complementarity of instruments and their capability to address the outcomes of climate change. For sustaining the delicate Himalayan Eco-system considers scientific and technological inputs and local decisions on downstream ecosystem services are essential. A participatory and sector ally coordinated mixed governance approach is necessitous to sustain ecosystem services in the region.

The paper analyses tries to have a reflexive engagement with the existing literature to measure vulnerabilities of existing ecosystems including the adaptive capacity of current institutional and physical structures to deal with climate variations and other socio-economic changes. Critical thresholds of vulnerabilities and barriers to adaptation in the resource systems will also be examined. To achieve this, socio-cultural implications and potentials for integration of indigenous knowledge systems would be evaluated and integrated into the mission actions which is hard to achieve in the current scenario.

**Keywords:** Climate change, Ecosystem, Sustainable development, Adaptation, Habitat, Vulnerability

## 1. INTRODUCTION

Climate change is one of the most enthralling global challenges. According to the National Aeronautics and Space Administration (NASA), the planet's average surface temperature has risen a little more than one degree Celsius during the last century. Records show that 2017 was the third consecutive year in which global temperatures rose by a degree above levels recorded in the late 19th century. The year 2017 was also recorded as the warmest non-El Niño suffering with extreme weather conditions across the globe. According to the Intergovernmental Panel on Climate Change (IPCC), "rising temperatures will be accompanied by a change in rainfall patterns and increase in the frequency and intensity of extreme weather events around the world".

While the conditions have been worsening around the globe due to rise in temperature and global warming, India is no exception to it, the Indian government in 2007 established the Prime Minister's Council on Climate Change (PMCCC) as response to increasing extreme weather conditions. The Council, in coordination with other government departments, published the National Action Plan on Climate Change (NAPCC) in 2008 (ahead of the hyped Copenhagen Climate Summit 2009), which comprised eight national missions to be achieved through decentralizing and coordinating with State governments with their respective State Action Plans on Climate Change (SAPCC).

The degrading environmental conditions are resulting in disastrous consequences for human life and the Ecosystem. There is a need to bridge knowledge gap on climate change and protect the Himalayas.

The foremost objective of this paper lies in generating the curiosity of the reader in assessing the effectiveness of the National Mission for Sustaining Himalayan Ecosystem (NMHSE) in sustaining and promoting ecosystem services in the Indian Himalayas.

## 2. BACKGROUND

Sustainability of the Himalayan ecosystem is important for the livelihood of about 1.3 billion people in Asia. The Himalayan region is well known for its rich natural geological wealth, forestry, wild life, flora, fauna and biodiversity, snow, ice and water bodies, traditional knowledge and mountain agriculture which is now becoming fragile. The perennial rivers of north India depend heavily upon the sustainability of Himalayan glaciers and its Ecosystem. The path of development of India, China and other countries sharing the Himalayan ecosystem should be harmonious with the sustainability of the prevailing Himalayan ecosystem. The region is also characterized by its geological phenomena and hazards of natural disasters like landslides and earthquakes. The occasional events releasing large amounts of energy pose a challenge to the planners and to the development aims of the states in the region. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) has concluded that "there is unequivocal evidence of current trends of global warming of earth's atmosphere caused by anthropogenic emissions". The IPCC also estimated that "global average surface temperatures would increase in the range of 1-6.3°C over the next 100 years". It widely recognised that climate change is not just about averages, but also of extremes. Increasing temperatures and changing precipitation patterns in the Indian Himalayan Region can be expected to be affect the regional mountain ecosystems and some sections of human populations inveterately. The changes can be expected to be Sophisticated. Effects of climatic changes on the environment and people's livelihoods is most likely to impact health, agriculture, forests, water resources, coastal areas, species and natural areas. This paper stresses on a compelling need for a united effort to understand the implications of climate change on vulnerable sections of people and develop exceptional strategies for sustaining brittle ecosystems on which large number of people depend.

## 3. IMPORTANCE OF ECOSYSTEM

Mountain ecosystems consists approx. half of the world's biodiversity hotspots (UN 2020). They primarily adhere the livelihoods of people living in mountain regions and provide crucial ecosystem services to inhabitants of lower lands, including freshwater, timber and recreation. The Hindu Kush Himalaya (HKH) is the source of ten of Asia's largest river systems and the main source of freshwater in South Asia (Alf than et al. 2018). Ecosystem services from the Hindu Kush Himalaya preserves a roughly 240 million people in the region and 1.7 billion people in downstream river basins (Xu et al. 2019). Global warming is significantly impacting Hindu Kush Himalaya. Glacier volumes are expected to decline by up to 90 per cent throughout the 21st century. Degradation of permafrost is projected to destabilize mountain slopes, change hydrology and menace infrastructure. Hindu Kush Himalaya is suffering from environmental degradation due to overexploitation of natural resources, land use and land cover change (Bloch et al. 2019). Mountain Eco-systems also Known as the 'water towers of the world', accomplish the freshwater needs of half the global population (CBD 2007; UNEP, Grid-Arenda, GMBA 2020). For example, Mount Kenya, provides water to over 7 million people, while the Andes water to over 95 million. Mountains are also a source of food: of the 20 plant species that supply 80 per cent of the world's food, six – maize, potatoes, barley, sorghum, tomatoes and apples – originated from and have been diversified in mountains (UN 2020). Deterioration of mountain ecosystems is endangering crop production, animal husbandry and food security (Romeo et al.

2020). Globally nearly half of the mountain population in developing countries, live in areas unveiled to progressive land degradation. Out of which 178 million are considered vulnerable to food insecurity (FAO and UNCCD 2019). Over the past 200 years, floods due to glacial lake outbursts have caused nearly 400 deaths in Europe, 5,700 in South America and 6,300 in Asia, and the number of new glacial lakes is increasing with climate change. Changes in glaciers and snow affects run-off in some river basins, in turn impacting local water resources and agriculture (Hock et al. 2019).

Eco-systems have an implicit capacity to combat incremental changes in climate and landscape, guiding to a natural carrying capacity of eco-system. When this capacity is exceeded, the ecosystem features get changed in ways that become socially and environmentally objectionable. This further leads to well loss of rare or endangered species, migration of species, and shifting of habitats which have implications for survival of life, including human beings.

Ecosystem restoration circumscribes a huge variety of approaches that contribute to conserve and repair damaged ecosystems (UNEP and FAO 2020). This may involve active regression or to evict drivers of degradation to 'passively' promote natural reincarnation.

## 4. NATIONAL ACTION PLAN FOR SUSTAINING HIMALAYAN ECOSYSTEM AND CLIMATE CHANGE

The National Mission for Sustaining Himalayan Eco-system (NMSHE) emphasises to :

- a) understand scientifically the complex processes affecting this eco-system,
- b) evolve suitable management and policy measures for sustaining and safeguarding the Himalayan eco-system including Himalayan glaciers and
- c) work with the states in the Indian Himalayan region in the implementation of scientifically derived policy measures.

The Cabinet approved the National Mission for Sustaining the Himalayan Ecosystem on 28 February 2014. The Planning

Commission recommended a provision of Rs 900 crore to be made during the 12th FYP (2012–17). The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) is run by the Department of Science and Technology (DST) and aimed at evolving conservation measures for sustaining and safeguarding the Himalayan glaciers and mountains through monitoring network, promotion of community-based management, human resource development and strengthening regional cooperation.

The mission is based on the inputs and actions of several stakeholders. For instance, inputs from the Ministries of Science and Technology and Environment and Forests as well as the planning commission and actions of the states in the Indian Himalayan Region are required. The mission planned for a sound coordination mechanism for establishing cooperative and cohesive actions by the states in the Indian Himalayan Region (IHR). The Ministry of Science and Technology has been charged with the responsibility of implementing this mission using scientific and technological inputs essential for sustaining the flimsy Himalayan Eco-system. However, zestful cooperation with the Ministry of Environment and Forests and Planning commission and concerned state governments is a prerequisite for successful implementation of the mission. The mission attempts to evolve management measures for safeguarding and repositing the Himalayan glaciers and mountain ecosystem by:

- Enhancing monitoring of Himalayan ecosystem with special attention on recession of Himalayan glaciers and its impact on river system and other downstream socio-ecological processes.
- Establishing observational and monitoring network to analyse ecosystem health including freshwater systems.
- Promoting community-based management through developing mechanisms for incentives for conservation and elevating forested lands.
- Strengthening regional cooperation through demonstrating mechanisms for exchanging information with countries sharing the Himalayan ecology.

The **six task forces** were finalized for effective implementation which were-

- a) Natural and Geographical Wealth by the Wadia Institute of Himalayan Geology
  - b) Forest Resources and Plant Biodiversity by GB Pant Institute on Himalayan Environment and Development, Almira
  - c) Micro Flora and Fauna, Wildlife and Animal Population by Wildlife Institute of India, Dehradun
  - d) Traditional Knowledge Systems by JNU
  - e) Water, Ice, Snow and Glaciers by National Institute of Hydrology, Roorkee
  - f) Himalayan Agriculture by Indian Council of Agricultural Research (ICAR)
- State climate-change centres were set up in the seven Himalayan states and UT namely, Jammu and Kashmir, Himachal Pradesh, Manipur, Mizoram, Tripura, Sikkim and Meghalaya.
  - A capacity-building programme titled 'Indo-Swiss Capacity Building Programme on Himalayan Glaciology' was launched by Department of Science and Technology in collaboration with the Swiss Agency of Development and Cooperation (SDC), with the crucial objective to build capacity in the spheres of glaciology and related areas in climate change.

#### 4.1 MAIN OBJECTIVES OF THE MISSION

The foremost and primary objective of the mission is to create a sustainable National capacity to constantly assess the health status of the Himalayan Ecosystem and sanction policy bodies in their policy-formulation functions and support States in the Indian Himalayan Region with their implementation of policies selected for sustainable development.

This integrated objective would demand:

- a) scientific assessment of the vulnerability of the Himalayan ecosystem to short and long-term mutability in the weather and climate in all its dimensions of physical, biological and socio-cultural aspects,
- b) research for framing evidence-based policy measures to protect the delicate ecosystem and
- c) time-bound action programmes at the state level in the Indian Himalayan Region to sustain ecological resilience and assure the continued provision of necessary ecosystem services.

##### 4.1.1 Sustainable Urbanization in Mountain Habitats

The cities in the Himalayan mountainous zones are growing in size and in numbers afflicting the same degradation that prevails in cities in the plains – growing dumps of garbage and plastic, untreated sewerage, chronic water shortages, unplanned urban growth and heavy pollution from rising vehicular traffic. This phenomenon will only exacerbate the impact from climate change.

##### *Building successful ecosystem restoration*

Highlighting the interlinkages between reinstating ecosystem health and economic sustainability is essential for restoration of the build-back better recovery plans and the equitable delivery of benefits (Aronson et al. 2020). Initiatives to raise awareness of the risks posed by ecosystem degradation is crucial for raising restoration finance (Dasgupta 2021). over-exploitation of natural resources

is inlaid in our economies and governance systems. Breaking this requires considering the environmental externalities the unaccounted impacts for nature and future generations of existing approaches for planning economic development. At present, global activities that degrade ecosystems are subvert at an estimated USD 4–6 trillion per year (Dasgupta 2021).

The enabling environment for private sector investment needs to be supported via regulatory frameworks, finance mechanisms, safeguards for investment, and through public-private partnerships. Public funding can accelerate private investment to convert conventional production systems into more sustainable models using de-risking tools such as guarantees, layered funds and support for innovative microfinance initiatives (CPF 2021). Communities and civil society need to be engrossed and supported to secure ecosystem restoration across scales. Public and private funds can help communities secure land tenure and assist local investment in ecosystem restoration. These may be promoted based on payments for ecosystem services or in response to voluntary environmental performance and certification commitments. Education is also vital to assure that future generations gained from a greater understanding of nature and an appreciation of its value (Dasgupta 2021).

Investing in ecosystem restoration will be fundamental to transform to sustainable economic development that works in balance with nature. Directing financial flows towards such investment needed progressive integration of information on ecosystems into economic planning tools. It also seeks financial systems that channel investments towards economic activities that reinforce ecosystems (Dasgupta 2021).

#### **4.1.2 Effect of Climate Change on the Himalayan Ecosystem**

Ecologically sensitive mountainous areas, like the Himalaya, are prone to adverse impacts of global climate changes on account of both natural causes and anthropogenic emissions in other parts of the world as well as those arising out of unplanned developmental activities in the region. Himalayan Ecosystem resources are critical to natural disturbances, anthropogenic activities and climate change. It has important inferences for formulation of management strategies and sustenance of dependent human societies. Some of the important consequences arising out of the global warming on the Himalayan region could bring together a) variability in the volumetric flow of water in the rivers, b) loss in biodiversity, c) unsustainable changes in ecology, d) glacier recession, e) deforestation and degradation, f) conditions for impending natural disasters and g) dislocation of traditional societies rests vulnerably on the Himalayan ecosystem. Ganges, Brahmaputra, Yamuna, and other major river systems generated in the Himalayas. Any changes in the Himalayan glacier dynamics and melting are required to adversely affect about 1.3 billion of people. The Indian Himalayan Region (IHR) nurtures about 8000 species of flowering plants, i.e., nearly 50% of the total flowering plants of India. Of this, about 30% are endemic to the region. There are over 816 tree species, 675 edibles and nearly 1740 species of medicinal value in the IHR. The Himalaya with its vast green cover acts as 'sink' for carbon dioxide. Annual carbon sequestration by the forests of western and northeast Himalaya is one of the crucial ecosystem services being performed by the Himalayan forests.

Therefore, this service required to be further stabilized and exploited for global good. Further, huge area under permanent snow cover and glaciers (about 17% of IHR), and about 30-40% under seasonal snow cover, form a unique water reservoir. This caters several perennial rivers that provide water for drinking, irrigation, and hydropower. Indian Himalayan Region is home to about 4% of the country's population, and is granter for their livelihoods.

#### **4.1.3 Rational or Scientific model for policymaking?**

Under the rationalist policy model, scientists talk about reality to bureaucrats and politicians, who then act rationally to determine policy. The retinal model usually relies on expert and authoritative knowledge, which is framed and created by a small group of senior administrators and government research institutions. Hence Policy tends to construct, upon narrow foundations of knowledge, a unique analysis of the problem and what should be done about it.

There may be some mutual framing of the research questions by government and researchers, but the results of scientific study are treated as dominating and apolitical, since it's based on scientific methods that stand above politics, there are many reasons for the persistence of the rationalist/expert-led model of environmental policymaking, the rationalist style of policymaking can suffer from a number of flaws. Policymakers uses the political and digressive style of policymaking allows a new form of natural science to environmental management practices that are deliberative, inclusive, and participatory these policies tend to be ultra conservationist and top-down. State-imposed tenure regimes and tough exclusionary policies in the name of conservation often produce worse outcomes.

Whatever the approach, restoration needs time, resources, knowledge, assisting policies and governance to contribute to human well-being, economic development, climate stability and biodiversity conservation.

#### **4.1.4 Strengthening of Regional Cooperation**

Himalayan ecosystem is vulnerable to global emissions and impacts of climate changes. There are multiple trans-boundary and regional issues closely inlaid with the resilience of the Himalayan ecosystem. There is a need for improving trans-boundary exchange

of information through mutually agreed mechanisms and processes. The important participation of the Ministry of External Affairs and collaboration of Ministry of Environment and Forests as well as Ministry of Défense are important. There is a need and scope for encouraging collaborative projects with trans-boundary implications and collaboration. For addressing issues of emergency following of an outbreak, resource sharing, and understanding of administrative and jurisdictional functions, aspects like collective surveillance and testing with enhanced communication of each other may need to be considered. Currently it is much required for strengthening international cooperation in the Mission on Himalayan eco-system. Exceptional strategies may need to be devised after consultations with the other ministries coordinated and led by the Ministry of External Affairs.

#### 4.1.5 Safeguarding the Himalayas: A National Endeavour

There are severe concerns about the challenge India faces from the impact of climate change on the fragile and life-sustaining ecology of the Himalayas. This magnificent mountain chain is acutely linked with India's civilizational ethos and the spiritual and cultural delicacy of Indians. It is much needed to initiate and establish a truly national endeavour to safeguard the primitive ecology of the Himalayas. A cooperative approach between the Union and state governments in the Himalayan states is mandatory to successfully meet this challenge. It is in this spirit that the prime minister should convene a meeting of the chief ministers of the Himalayan states. For sustaining the Himalayan ecosystem, the prime minister and the chief ministers should meet regularly to exchange views and review progress to make this national mission a success.

#### 4.2 ASSESSING THE NATIONAL ACTION PLAN FOR SUSTAINING HIMALAYAN ECOSYSTEM

India is now more vulnerable to climate change. According to the Global Climate Risk Index of 2018, published by German Watch, India is the 12th most vulnerable country to climate change consequences. Every year, it witnesses an average of 3,570 deaths due to climate-related events, and the cost of climate change impact it will pay is expected to run into trillions of dollars in the near future.

National Mission on Sustaining Himalayan Ecosystem presently confronts financial and technical constraints. Skilled expert manpower is also a challenge. Moreover, the mission objectives require coordination among research and scientific institutions and the ministries, which has emerged as a major challenge. In this process of coordination, objectives are also distributed among stakeholders, leading to dealing of issues with different approaches and delays in implementation.

Because of the cross-cutting nature of ecosystem services, they are not confined to a single subject or administrative agency, department, or ministry their management and sustainability require national dedication and a policy portfolio approach combining several measures (Gunningham & Young 1997; Dresbach & Mints 2011; Ring & Schroter - Schlaak 2011). This is reflected in the National Action Plan on Climate Change through the National Mission for Sustaining Himalayan Ecosystem that proposes to network knowledge institutions to establish a coherent database on scientific and social dimensions of conserving the Himalayas, to detect and decouple natural and anthropogenic causes of environmental change, assess the impacts of climate change and study traditional systems for community's adaptation to it, create sustainable tourism and resource development, increase awareness among stakeholders in the region, to assist states in the Indian Himalayan region with informed actions and develop regional cooperation with neighbouring countries (Government of India 2010; Smith 2014). However, the success of implementation of National Sustaining Himalayan Ecosystem remains to be seen.

Sustaining Himalayan eco-system is a challenging task.

It involves six different sets of actions namely

- a) Generation and sharing of reliable data as inputs for formulation of policies,
- b) Identification and selection of good practices and actions for protecting the Himalayan ecosystem based on both modern and traditional knowledge systems
- c) Supporting of the selected actions with suitable regulatory framework,
- d) Ground-level implementation of selected actions and plans at the levels of Indian Himalayan States and
- e) Development of regional cooperation among the neighbouring countries and
- f) Continuous monitoring and oversight for ensuring the implementation of selected paths.

#### Road Ahead

A study revealed by UNEP-WCMC highlighted that there is a high degree of coverage of ecosystem services in policy instruments but this is still insufficient because the concept of ecosystem services evolved recently and there are constraints to defining, assessing, and regulating impacts on ecosystem services (CBD & UNEP-WCMC 2012). The understanding of the complementarities and inter-linkages of ecosystem services is parochial.

Current ecosystem-based approaches have suggested that policies and measures be adopted that take into account the role of ecosystem services in reducing societal and ecological vulnerability through multi-sectoral and multi-level approaches (Andrade et al. 2011). Economists, environmentalists, and lobbyists have proposed various types of policy mixed approach, arguing that 'single-

instrument' or 'single-strategy' approaches are misguided and when used at individual level fail to address complex causes of ecosystem service degradation (e.g., Gunning ham & Sinclair 1999; Ring & Schroter-Schlaak 2011).

The appearing policy framework for the Himalayas needs to address the ecological issues and human well-being in the face of emerging anthropogenic pressures and climate change impacts, and encourage involvement of local communities in the conservation and maintenance of ecosystem services by promoting an enabling governance environment in the region.

This would enable community-based self-organized systems for biodiversity conservation to coexist along with state-imposed policies and take lessons from other countries (e.g., Ostrom et al. 1999).

It is high time that pressing issues need to be addressed. This is only possible when not only the government but various stakeholders such as NGOs, local communities and other civil society members come on the same board.

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