

Adaptation & Mitigation Initiative to the Challenges of Global Warming – Uttarakhand Perspective

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Abstract

In the background of IPCC reports and the relevance of National Missions on Climate Change to Uttarakhand, the key vulnerabilities for the state have been identified in the paper. The adaptation and mitigation initiatives to the challenges of Global Warming from Uttarakhand perspective have been included sector wise. Important sectors include Forestry, Water Resources, Eco-systems and Biodiversity, Non Timber Forest Produce, Eco-tourism, Energy and Housing sectors. The paper further focuses on sector wise initiatives towards meeting the global warming challenges for Uttarakhand on one hand and ensuring sustainable development on the other end. The important and critical interventions include generation of livelihood options through community involvement by way of sustainable management of forests & natural resources with the active delivery based networking of Van Panchayats. The initiatives in the paper provide an opportunity to strategically manage the challenges of global warming. Key initiatives discussed in the paper are rehabilitation of degraded forests with focus on mixed species, community involvement in rejuvenation of broad leave oak forests, pragmatic use of pine needles & lantana for forest fire management and meeting energy needs, developing bio-fuel plantations on degraded land, bringing industrial and urban areas under green cover along with waste management, soil



conservation and water harvesting through revival of traditional & scientific knowledge, generation of additional income for community, and Appropriate Rangeland management in alpine areas with emphasis on shrubs of high medicinal value. Other mitigation interventions suggested in the paper are support to private tree-shrub growers, maintaining habitat integrity by rationalizing protected area boundaries, improving energy efficiency performance, extending wood product life cycle, and multi-stakeholder partnerships for eco-friendly tourism.

Introduction

Climate change is one of the most significant threats to human civilization in current times. The Intergovernmental Panel on Climate Change (IPCC) has come out with its Fourth Assessment Report (FAR). It has been established statistically that “Warming of the climate system is unequivocal ...”¹. The evidences include rising global average air and ocean temperature, widespread melting of snow and ice and rising global average sea level. There are changes in precipitation and more frequent and more severe extreme weather events. These changes have been brought about by growing concentrations of GHGs, namely, CO₂, CH₄, NO₂, among others, predominantly as a result of human activities. The effect will continue for centuries even if GHG concentrations were to be stabilized.²

The climate change affects the weather patterns, water availability, distribution of bio-diversity, the productivity of the crops etc. Therefore climate change has wide-spread impacts on ecosystems, food security, coastal regions, industry, settlements, society, health and water among others. In response to the above needs, there are international bodies/instruments at work like IPCC and UNFCCC. The important predictions about climate change impacts on Asia as given by IPCC, relevant to Uttarakhand are³³ IPCC, FAR, Synthesis report, pp. 50. FAO Report decrease in Freshwater availability by 2050s, Pressures on natural resources and the environment associated with rapid urbanization, industrialization.

There has been a serious attempt by the Government of India to address climate change through the release of initial NATCOM, 2004 and National Action Plan on Climate Change, 2008. Based on the Global and National Scenario, it is imperative for the Uttarakhand Govt to take stock of the existing situation, and define what contributions can be made at the state level for Adaption and Mitigation.

The role of forests and forestry sector is very important in the global climate change scenario. The forests can act both as sources and sinks and thus have a unique relation to the climate change issue. Many of the findings are robust only at the global level and more detailed studies need to be done at regional and sub-regional levels, including various sectors and socio-economic parameters. Under the given circumstances, the adaptation and mitigation initiatives for meeting the challenges of global warming from Uttarakhand perspective have been covered in the present paper. It is evident that most nations are still at an elementary stage in this direction. They are yet to come up with follow-up actions to UNFCCC’s Nairobi Work Plan.



Climate change – an Uttarakhand perspective

Based on the reports of IPCC and the National missions which have been established, it is important to identify the key vulnerabilities of the state of Uttarakhand, the action which needs to be taken based on the National Action Plan for Climate Change and other adaptation and mitigation strategies.

Key vulnerabilities for Uttarakhand

The total forest area of Uttarakhand is about 65% which includes forests, alpine meadows and glaciers. Keeping the IPCC reports as the basis, the following are the key vulnerabilities for Uttarakhand.

- 1) The Himalayan Eco-system and particularly the bio-diversity in higher altitudes is at risk with the rise in global temperatures.
- 2) The precipitation will be with increased intensity and become more erratic. This will make the fragile ecosystems susceptible to damage by cloud bursts, increased soil erosion etc.
- 3) The alpine meadows have highest Soil Organic Content and are very good at sequestering carbon. The increase in global temperatures threatens the existence of alpine meadows.
- 4) There will be a gradual shift of plant species and human habitations towards higher altitudes leading to a heavy stress on housing sector, water availability & soil erosion.
- 5) The tourism activities are likely to increase in near future. This will cause severe stress on the fragile Himalayan eco-systems which are already reeling under the pressure of water-scarcity, excessive constructions, heavy usage of fuel-wood, improper waste management to name a few.

Forest Policies, Programs and Practices Reducing Forest Vulnerability

India has implemented a large number of forest conservation and development programs that have the potential to reduce the vulnerability of forest ecosystems to impacts of climate change. The details of these are given in the sections below:

Forest policies

India has formulated a large number of innovative and progressive forest policies, which have the potential to reduce vulnerability and needing effective implementation. Incorporation of climate concern in forest policy making process and in the forest 'working plan' process to enable prescriptions of *climate friendly silvicultural practices* to promote adaptation. Improve and ensure the effective implementation of existing policies/Acts such as Forest Conservation Act 1980, Wildlife Protection Act 1972 & 2002 and linking Protected Areas, Wildlife Reserves and Reserve Forests. Involvement of local communities in forest protection, regeneration, creation of long term stake in forest health, implementation of fire prevention and management practices and the adoption of short rotation species and sustainable harvest practices for timber & NTFP products will be some of the policy prescriptions.



Relevance of National Missions for Uttarakhand

The NAPCC identifies eight major missions at the national level to combat climate change. Following four missions out of eight are directly relevant to Uttarakhand. The initiatives and actions to be undertaken regarding these missions is as follows:

National Water Mission

There is already an acute shortage of water at the state level throughout the hills of Uttarakhand. Hence, strong measures need to be taken to overcome the problems of water scarcity through watershed management, Afforestation and conservation of wetlands.

National Mission on Sustaining the Himalayan Ecosystem

Proper land-use planning and cultivation of medicinal & aromatic plants and promotion of eco-tourism activities with emphasis on soil, water & bio-diversity conservation, needs to be executed.

National Mission for a Green India

For increase in forest cover and density, identification of fast-growing and climate-hardy species which have maximum carbon sequestration potential, involving community based participation in plantations and containing the forest fires needs to be ensured.

National Mission on Strategic Knowledge for Climate Change

Under this mission, the climate models for the state of Uttarakhand need to be developed through the collaboration of forest department, academia and NGOs to help the planners to take adaptation and mitigation measures.

Adaptation Strategies

The changes at the global level, which are occurring due to anthropogenic factors, can be addressed to a certain extent through adaptation strategies. In this part, certain general no-regret efforts which can be made with the current understanding have been stated.

Issues to be addressed in Adaptation

The major issues which need to be addressed in adaptation are:

- 1) Identifying critical ecosystems and species and initiating measures that would reduce pressure on those ecosystems/species and ensuring their conservation either through *in situ* and *ex situ* means.
- 2) The working/management plans should incorporate climate concerns, at least in very critical areas.
- 3) Building the capacity of the forest department to understand the vulnerability of the forest ecosystems to climate change is of prime importance and must be undertaken immediately.
- 4) The most important adaptation measure is the sustainable management of forests (SFM). The key issues in this direction are: Rehabilitation of degraded forests; Enhancement of forest productivity;



Strengthening JFM; Promoting agro forestry and rangeland management; Enhancing demand side management; Improving livelihoods of the forest communities; Enhancing PA network and Promoting watershed approach.

Sector-wise Adaptation Suggestions

The adaptation strategies for the most common sectors having a great potential to affect the way of living in changed climate have been stated.

Forestry

The forests are the major sequesters of carbon in the terrestrial systems. At a global scale, deforestation is a significant source of carbon emissions and therefore in short term, containing deforestation is a better option than afforestation. Uttarakhand is holding about 189 million cu m of growing stock out of which less than 0.3 million cu m is being extracted currently. To avoid big leakages like fire, insect attack etc. it is imperative that this stock be extracted and used scientifically in a sustainable manner. The post processing technologies for harvested wood needs to be improved to contain the carbon release into the atmosphere and agro-forestry in farmland need to be encouraged. The fuel wood extraction is one of the most significant reasons of forest degradation. Young plantations and young regenerating crops are more effective in sequestering carbon compared to mature stands.

Water resources

More than 40% of world population is dependent on the water bodies originating from Himalayas. As a consequence of global warming, the glaciers are currently receding much faster than any other time in the history. With regards to the water resources, the forest department can undertake the following steps:

- 1) Increase of forest cover and densification of existing cover in the catchment areas of the major rivers to increase the water retention of the forests and will make rivers more resilient against shortage.
- 2) The weather stations need to be installed at many places to monitor the weather data at the remote locations.

Eco-systems and Biodiversity

The changes due to global warming are likely to push many eco-systems beyond their resilience by an unprecedented combination of climate change, associated disturbances like flooding, drought, and other global change drivers. There should be renewed efforts to document the biodiversity, and ensure *in-situ* & *ex-situ* conservation.

Non Timber Forest Produce (NTFP)

There is a significant collection of NTFPs from the forests of Uttarakhand. The major NTFPs include collection of moss and lichens, high value medicinal plants and rare fungi like Yarsagumba. The NTFP extraction should be done very scientifically so that undue pressure is not exerted on the resource which may lead to their extinction.



Eco-tourism

As the global temperatures rise, it is expected that there will be a larger influx of tourists towards high altitude areas in search of pleasant climate. The hills are already water-scarce and heavy infrastructure development is taking its toll on the fragile Himalayan eco-systems. Immediate need is to have:

- 1) A policy for regulating and managing the eco-tourism at the state level with benefits to locals.
- 2) The forest department should start certification process of best-practices for eco-tourism.
- 3) The regulation to sensitive areas and visits to glaciers needs to be contained to minimize the impacts.

Energy

The forests of Uttarakhand support the energy needs of significant amount of population by providing fuel-wood. Besides this, the high hydroelectric potential of Uttarakhand can be sustained only if the forests survive as there is imminent danger that the glaciers may melt completely in next few decades. Hence, to meet the energy needs of the people, Briquette making machines using waste materials, leaf litter especially pine needles etc. as input needs to be popularized at a large scale. This will have twin benefit of controlling the recurrent forest fires as well as containing the degradation of the forests.

Mitigation Strategies

The mitigation processes involves removing the GHGs from the atmosphere as well as reducing the emissions through the use of clean technologies, which would have otherwise resulted in emission of GHGs. Newer and newer facts are piling up with the advancements on the research front. So what follows can only be of an indicative nature.

Sector-wise mitigation suggestions

Forestry

The forests are the major sequesters of carbon in the terrestrial systems. At a global scale, deforestation is a significant source of carbon emissions and therefore in short term, containing deforestation is a better option than afforestation. There is a need to carry out studies to find out the impact of global change on the carbon mitigating capacity of the forests. The village communities can earn carbon credits by just protecting their forests under REDD which is currently not-recognized under the Kyoto protocol.

Energy

The large hydroelectric dams are very high emitters of CH₄, which has 60 times more pronounced effect on climate change as compared to CO₂. Hence, policy level decision needs to be taken on the viability of such dams in relation to run-of-the-river projects. Smaller streams and rivulets can be tapped to form a state wide grid through pico and micro hydroelectric projects whose combined capacity can be



significant. The alternate energy potential needs to be realized through a combination of alternate energy sources like wind power, solar etc.

Construction/Housing

There is a significant amount of energy which is spent in the building for heating, cooling or lighting. A proper design though the enforcement of building code to ensure energy efficiency of building is required. More eco-friendly construction materials need to be incorporated to reduce the overall carbon-foot print of building constructions.

Kyoto Protocol – attracting funds for mitigation

The Kyoto Protocol envisages three main channels for attracting funding for emission reduction activities, namely, joint implementation, emissions trading and clean development mechanism (CDM). The data on carbon sequestration potential of Uttarakhand needs to be worked out and this can be a major thrust area for research. Uttarakhand has around 12,000 van panchayats with a total forest area of 5450 sq.km. under their command where local communities are actively involved in forestry operations. They should be viewed as likely claimants for revenue generated from CDM.

Conclusion

The importance of Uttarakhand as major player in the actions to be taken for combating global warming has already been emphasized. This has adequately been acknowledged in NAPCC by formulating a separate mission on Himalayas, of which Uttarakhand is a part. While the major contributors for the global warming have been the urban transport systems and the industries, there is little doubt that forestry offers a most viable solution to sequester the excessive carbon dioxide which has been emitted heavily in the last few decades. This creates an opportunity for the forest department for working in tandem with academia as well as other branches of government to combat the problem of global-warming. Uttarakhand forest department is therefore placed at a very significant position wherein it can leverage the opportunity to work for the global cause and helping the country and the world to adapt and mitigate the effects of Global Warming.

References

- ¹ IPCC, FAR, Synthesis report, pp. 30.
- ² IPCC, FAR, Synthesis report, pp. 46.
- ^v FAO, Global Forest Resource Assessment, 2005.
- ^{vi} IPCC, FAR, Synthesis report, pp. 52.
- ^{vii} IPCC, FAR, Synthesis report, pp. 54.



The world's energy system is at a crossroads. Current global trends in energy supply and consumption are patently unsustainable — environmentally, economically, socially. But that can — and must — be altered; there's still time to change the road we're on. It is not an exaggeration to claim that the future of human prosperity depends on how successfully we tackle the two central energy challenges facing us today: securing the supply of reliable and affordable energy; and effecting a rapid transformation to a low-carbon, efficient and environmentally benign system of energy supply. What is needed is nothing short of an energy revolution., November 12, 2008.

International Energy Agency World,
Energy Outlook 2008