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Green Growth and Adaptation in Himachal Pradesh

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1. Introduction

Adaptation is one of the most prominent response strategies required to cope with climate change impacts. Adaptation to changing climate does include many aspects which are not new as societies have been coping to changes since centuries but unprecedented anthropogenic climatic variability has added a new dimension of uncertainty which makes coping difficult for the communities and ecosystems. This also implies use of new technologies and involvement of more stakeholders in the process of adaptation as compared to traditional coping practices (Fussel, 2007). Adaptation to climate change is usually planned or implemented for selected target systems at local to region scale. This is because multiple factors at the local level function as drivers of vulnerability. India as a country has immense diversity in terms of physical and socio-economic factors which results in a complex vulnerability profile across regions and sectors thus requiring action at sub-national levels.

Himachal Pradesh (HP) is a mountainous state located in the western Himalayas having an area of 55,673 km^2 and a population of 68,56,509 (Census of India, 2011). The state is enormously rich in natural resources with ecosystems being sensitive to climate variations. With high dependence of economy and livelihoods on natural resources and ecologically fragile ecosystems, HP is highly vulnerable to climate change. The state has been facing environmental issues such as deforestation, landslides, land degradation and desertification which have added to the vulnerability of the state. According to the State Action Plan on Climate Change (SAPCC) of Himachal Pradesh, financial constraints and limited resources have aggravated the challenges being faced due to these environmental issues. Climate change and its impacts being manifested on different sectors in the state are posing additional challenges for the state.

The observed data for key climate parameters like temperature and precipitation indicate changes within the state. The temperature data is showing warming trend over the last century with more increase in recent decades (1991-2002). The rate of increase of maximum temperature was observed to be more at higher altitudes as compared at lower altitudes. Changes in precipitation pattern have been observed including decrease in monsoon rainfall. There have also been changes in extreme events. Future projections also indicate warming, erratic rainfall patterns and change in patterns of extreme events (GoHP, 2012).

The state of Himachal Pradesh has very high dependence on natural resources and this is evident from the fact that a large fraction of the population is dependent on agriculture for livelihoods. Most of the agriculture is rain-fed and thus changes in precipitation will directly impact agriculture. In terms of direct impacts, a decline in productivity and quality of horticulture crops has been observed in Himachal Pradesh. For example, there has been a decline in apple production. There has also been a shift in apple line. However, with a shift in the growing zone, there might also be a short term increase in agricultural productivity.

Water resources have also been facing impacts of climate change. The state of Himachal Pradesh has three major rivers, namely Chenab, Beas and Ravi which originate from glaciers. Although more data is required to understand the impacts, spatial imageries show that there has been an overall reduction in glaciated area in the state. Rising glacial melt will

lead to increase in water levels in the major rivers of the state. Changes in the pattern of precipitation (rain and snow) will affect water availability in water bodies, will increase the likelihood of flood occurrence in flood free areas and increase the severity and duration in currently flood prone areas. Water scarcity might be faced during the summer season (GoHP, 2012).

In case of forests, adverse impacts are being faced in the form of shifting of tree line to higher altitudes and movement of pine species to higher altitudes. The rural livelihoods dependent on forests for fuelwood, fodder and Non-Timber Forest Products (NTFPs), will be impacted in case of adverse impacts of climate change on forests. Health risks are likely to increase in the state. Instances of malaria, water borne disease, jaundice, may break along river bed predominantly. These observed and likely impacts will adversely affect large percentage of population depending on natural resources.

2. Policy landscape for moving towards adaptation

2.1 State Action Plan on Climate Change

As discussed, Himachal Pradesh is facing significant vulnerabilities to current and future climate change posing threats to its natural resources and for the communities dependent on them. Adaptation is thus imperative for coping with the observed and anticipated risks and impacts in the state. Agriculture, water resources, forest and biodiversity are some of the key sectors driving the livelihoods of the majority of the population in the state and will thus require the necessary measures to facilitate adaptation. India released the National Action Plan on Climate Change (NAPCC) in 2008 to address the challenges of climate change. As part of this plan, each state of India has prepared a SAPCC in order to fulfill the objectives of the NAPCC. These SAPCCs are required for translating national policy as well as the objectives of the NAPCC into action especially at local levels. With the objective of responding to the threats of climate change, the Himachal Pradesh state government prepared the State Strategy and State Action Plan on Climate Change in 2012. The state action plan of Himachal Pradesh has been endorsed and approved by the National Steering Committee of the Ministry of Environment, Forests and Climate Change (MoEFCC).

2.1.1 Overview

The plan highlights common environmental issues faced and some current actions being undertaken with respect to each sector. Analysis of current status in relation to climate change shows that there are gaps in understanding of impacts and vulnerability of natural resources in the entire Himalayan region and specifically for the state of Himachal Pradesh. One of the major points highlighted in the plan is ''across the entire region, most of the available research focuses on adverse impacts of climate change and overlooks the adaptation mechanisms that local people have developed themselves, and have evolved the potential new opportunities. There is also lack of trained human resource and institutional set-up and policy imperatives to tackle climate change issues'' (Government of Himachal Pradesh, 2012). The plan identifies main entry points and ongoing activities with respect to each of the eight missions under the NAPCC along with short term adaptation strategies.

These short term adaptation strategies include comprehensive state level adaptation planning, integration of land use planning and climate adaptation planning, improved emergency preparedness, improved response capacity for climate change impacts, strengthening of the climate change research and science programs.

The plan lists possible suggestions for charting a trajectory for a green economy for Himachal Pradesh through green public procurement, green jobs, promotion of small scale and medium scale industries, enhancing corporate social and environmental responsibility, conservation of state biodiversity and ecosystem, sustainable consumption patterns and agricultural production and introduction of green tax for tourism.

The state is taking a number of initiatives as part of the development activities which can give co-benefits for adaptation to climate change. The plan gives sector-wise proposed broad actions and recommendations on adaptation as well as mitigation along with identified implementing institution, implementing period and an additional estimated budget for each of the sectors (Government of Himachal Pradesh, 2012). Some of the key sectors identified under adaptation include tourism and eco-tourism, health, biodiversity and ecosystem, water resources, forest, agriculture and horticulture. The recommendations however, seem to be a bit broad and need to take into account the climate projections for the state.

In order to respond effectively to the challenges of climate change, the state government constituted a state-level governing council on climate change under the chairmanship of the chief minister. The council has representation from all relevant stakeholders and departments. An executive council has also been set-up involving relevant departments for implementation and monitoring of the directives of the state governing council on climate change. The SAPCC of Himachal Pradesh presents an institutional framework for coordinating the activities of these entities which will be working on climate change. The Department of Environment, Science & Technology (DEST) of the state has been identified as the nodal agency to coordinate and deal with climate change issues. The department is also for monitoring and assessing state's progress in addressing climate change issues. DEST also has the responsibility to coordinate actions at local level with local and regional authorities. A centre on climate change has also been established for database and actions in this area.

The SAPCC of the state also lays out a plan to monitor implementation of its measures through an implementation status report which it plans to publish annually. The Department of Environment, Science & Technology (DEST) through the State Centre on Climate Change (SCCC) and the state council will coordinate the preparation of this annual report.

2.1.2 Progress on Actions

The state government of Himachal Pradesh has undertaken several actions which includes Himalayan chief minister's conclave on 'Indian Himalaya: Glaciers, Climate Change & Livelihoods' held at Shimla on October, 29-30, 2009 and the joint programme evolved therein called 'Shimla Declaration on Climate Change and Himalayan Development' (GoHP, 2015).

As mentioned earlier, a State Centre on Climate Change (SCCC) has been established under the state council for Science, Technology & Environment, DEST, Himachal Pradesh for synergizing the state's initiatives with the centre's initiatives. Within this centre, two major working groups have been formulated, the working group on 'Sustaining Himalayan Ecosystem' and the working group on 'Sustaining Agriculture and Horticulture' with expert scientists and institutions under each of them. The first meeting of the working groups was held in 2011 in which the key challenges and issues in relation to climate change were discussed in the context of climate change. A mechanism was discussed for the purpose of integration of different organizations with SCCC in areas of undertaking research and sharing of knowledge. Although the centre has limited funds but a mechanism has been designed to fund short term proposals in climate sensitive sectors (GoHP, 2015).

In the last couple of years, workshops and conferences particularly focusing on glaciers have been held. For instance, in 2013, a brain storming workshop on snow and glaciers and the Himalayan river systems was held, a National Conference on Himalayan Glaciology was held in 2014 and a conference on Snow Avalanche and Flood Hazards was also held in the same year. The ongoing and completed projects under the central government are mainly focused around glacier monitoring.

2.1.3 Institutional and Financial gaps

The SAPCC of Himachal Pradesh provides a framework for coordination of action among different institutions involved in the arena of climate change and for implementation of the SAPCC. Yet, there needs to be more clarity on the specific roles of some of these institutions. For instance, the role of the state and the centre in addressing climate change in the SAPCC process has not been clearly defined. The role of working groups formulated within the centre is also unclear. Also, the implementation plan does not give details on how it will be done at different spatial scales – at district, city, block and village levels. The plan does not give a mechanism to include local communities and stakeholders.

A major financial gap in the plan can be identified as that the budget estimates for adaptation and mitigation strategies have been given for each sector rather than the specific proposed activities. Also, the estimates have been quoted as the proposed budget with little information specified on the existing funds under each sector and there is lack of clarity on how much of this proposed budgetary requirement can be met through ongoing policies and plans. According to a preliminary analysis, this has resulted in estimates that do not necessarily speak of utilization of existing funds. There is a need to explore the sources of funding apart from the funds from the government including the role of private sector in financing climate change activities in the state.

2.2 Other Initiatives towards the challenges of climate change

The Government of India (GoI), the Government of Himachal Pradesh (GoHP), and the World Bank signed a $100 million development policy loan (DPL) agreement in 2014 to help HP move towards a more environmentally sustainable model of economic growth. This is the second loan agreement between World Bank and GoHP with the objective of promoting inclusive and sustainable growth in the state. The initiative aims at stimulating better

policies and practices for sustainable hydropower development, adaptation to and mitigation of climate change, empower local communities to improve conservation of their watersheds, promote cleaner methods of industrial production, promote environmentally sustainable tourism, and integrate GIS in decision making (World Bank, 2014). The first DPL of $100 million was approved in September 2012 and funded out of World Bank's International Bank for Reconstruction and Development (IBRD) resources. The loan helped in many of the development initiatives such as developing state roads, apple processing and marketing, hydropower projects and the Mid-Himalayan Watershed Development Project. The second operation, to further strengthen the initiatives of the first phase, will be financed by the Clean Technology Fund (CTF), which provides developing countries with positive incentives to scale up the demonstration, deployment, and transfer of technologies with a high potential for long-term reduction in greenhouse gas (GHG) emissions.

3. International Mechanisms relevant for HP

The activities identified under the different missions of the SAPCC of HP will require exploration of additional funding opportunities other than the government funding as well as technological support for implementation. There are a few international mechanisms which can be explored for financial and technological support.

3.1 Adaptation Fund

The adaptation fund (AF), which is financed with a share from the clean development mechanism (CDM) project activities and other sources of funding, is particularly meant to finance concrete adaptation projects and programmes in developing countries. The fund has been formulated under the Kyoto Protocol to assist in meeting costs of adaptation for developing countries, and in particular communities and sector that are predominantly vulnerable to the adverse effects of climate change. The funding within the Adaptation fund will be on full adaptation cost basis (UNFCCC, 2014a).

The adaptation fund is an example of direct access. In each country, there is a National Designated Authority (NDA) for recommending or endorsing project proposals for funding the Adaptation Fund Board (AFB). In India, the NDA for AF is MoEFCC. The responsibility of overall management of projects and programmes financed by the AF, however, lies with the National Implementing Entity (NIE). For example, in case of India, National Bank for Agriculture and Rural Development (NABARD) has been designated as the NIE. NABARD's role as NIE includes:

- Identification, preparation, and implementation of activities that would enable adaptation to the adverse effects of climate change.
- Ensure to meet the criteria adopted by AFB for project sanction.
- Ensure quality in operations and accountability for implementing projects according to the principles and modalities of AFB
- Management, operation, and use of funds for activities approved by the AFB based on standards established by AFB

- Ensure appropriate monitoring, independent evaluation, and financial audits of all activities funded by the AFB.
- Submission of periodic reports as prescribed by AFB

Source NABARD, 2014

To access funding through Adaptation Fund, government departments, research institutions, universities, NGOs, can submit project proposals directly to NIE (NABARD) according to the template prescribed by the Adaptation Fund.

3.2 Green climate fund

The Green Climate Fund (GCF) has been set up under the Convention to support the developing country parties on combating climate change through adaptation and mitigation activities. The resources for the fund are to be generated through developed country parties and other public and private sources. India, as a country, is eligible for accessing the GCF for getting financial support for adaptation and mitigation activities at national and regional level (GCF, 2014). Similar to the Adaptation Fund, the GCF will be accessible to institutions and government agencies within a country through a NIE identified in each of the countries. Projects can be prepared and submitted by the NIEs to the National Designated Authority (NDA) for endorsement to the GCF Board Secretariat for consideration and sanction. The NDA for the GCF in India is MoEFCC, similar to the AF. Recently, NABARD has been selected as the first NIE in India for the GCF for climate change adaptation and mitigation primarily in agriculture and rural sector (MoEFCC, 2014a, NABARD, 2015b). . The NIE will be accredited by the GCF Board on the basis of the recommendations of the national government and will be accountable to the GCF board for all the resources received from the fund for the projects and programmes.

3.3 Climate Technology Centre and Network

The Climate Technology Centre and Network (CTCN) has been formulated in order to assist in transfer of technology to developing countries. Its primary objective is to support developing countries in enhancing their clean technology capabilities and facilitating prompt action on the deployment of existing technologies. The role of CTCN is also to facilitate collaboration with the private and public sectors, as well as with academic and research institutions, in developing and transferring emerging technologies (UNFCCC, 2014b). This technological support to developing countries will be channelized through a national designated entity (NDE). The NDE has a prominent role in coordinating requests to the CTCN in synergy with national priorities and strategies. The NDE will be link between the CTCN and local stakeholders, including the private sector and government institutions.

3.4 Institutional needs for HP to benefit from the mechanism

In order to access funds from the Adaptation Fund under the Kyoto Protocol for adaptation projects, the process needs to be channelized through the NIE identified in India, which is NABARD. The state of HP needs to prepare specific adaptation proposals and approach NABARD for the funding. Once the project is endorsed by NDA only then it can be sent to

the AF secretariat for consideration and sanction. One of the prerequisites of proposals for funding is a justification of the extent to which the proposed project contributes to adaptation and climate resilience. The projects/programmes need to take in to account national sustainable development strategies, national communications and national adaptation programmes along with state vulnerabilities and priorities. The projects for funding can be at national, regional and community levels. The projects also need to give arrangements or mechanism for implementation.

The eligibility for receiving funding for projects from the AF includes:

- Endorsement of project by the Government
- Supporting concrete adaptation actions
- Provision of economic, social and environmental benefits
- Cost-effectiveness of the project
- Consistency with national developmental strategies/plans/national communications
- Adherence to relevant national technical standards
- Avoid duplication with other funding sources
- Justification for the funding

Recently the Adaptation Fund Board endorsed three projects from India - building climate resilience agriculture and water management in Tamil Nadu and Rajasthan (USD 1.227 million); improving the adaptive capacity of fishermen in Madhya Pradesh (USD 1.738 million); developing climate resilient livelihood systems for rural farmers in West Bengal (USD 2.534 million) (MoF 2014, NABARD, 2015a) .

NABARD in particular has been focusing on aligning strategies and activities to priorities listed under NAPCC and SAPCCs. It also plans to climate proof the wide array of NRM projects being planned and implemented in India (NABARD, 2014).

Similar to the Adaptation Fund, for the Green Climate Fund, once the funds of GCF are available for projects, the state of HP can prepare project proposals meeting the criteria laid out within the domain of GCF to access these funds.

For accessing the mechanism available for technology transfer under CTCN, HP or any other state of India will have to approach the NDE identified for India. NDEs are the national entities for the development and transfer of technologies and act as focal points for interacting with the Climate Technology Centre regarding requests from developing country Parties about their technology needs. The NDE identified for India is the Ministry of Environment, Forest and Climate Change (CTCN, 2015). HP can access this mechanism to facilitate better use of technologies for adaptation and mitigation. TERI is one of the centres of excellence for CTCN.

4. Ways Forward

4.1 Overcome institutional gaps

As mentioned earlier, the SAPCC of Himachal Pradesh provides an institutional framework for coordinating the action on climate change. However, there are some gaps that this arrangement can be said to have in terms of linkages. The establishment of the SCCC is a very good initiative and it will be even more beneficial if the implementation plan of SAPCC is coordinated with the activities of the Centre. For addressing the institutional gaps currently being faced in the state it will be useful to follow the UNFCCC framework of four I's for adaptation. These include integration, involvement, investment and information (Figure 1).

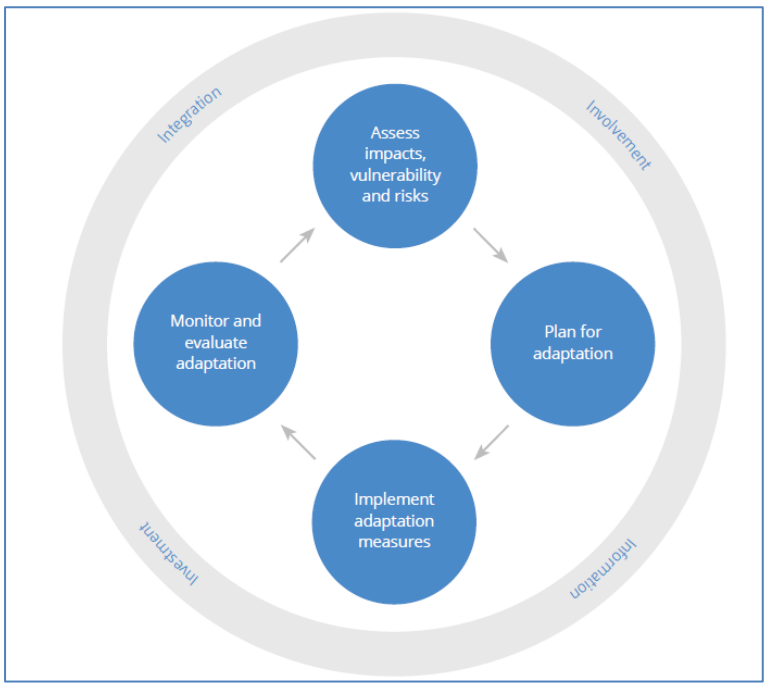

Figure 1: The four I's to adapt and address institutional gaps (UNFCCC, 2014c)

According to UNFCCC, institutional arrangements are predominant in facilitating the **integration** of adaptation into planning and implementation of development policies, strategies and projects. Clearly defined roles and responsibilities among different institutions involved including the DEST and the SCCC of HP will help in achieving the objectives laid out in the SAPCC and in ensuring the integration of adaptation into the development planning of the state.

The second component of this framework talks about the **involvement** of relevant stakeholders. Although the SAPCC of HP has involved a number of experts from different disciplines, it will be more beneficial to also involve the communities as well as other relevant stakeholders such as private players in the process of the implementation of adaptation strategies. Box 1 provides an example of a good practice of an implementation project in Bhutan as part of National Adaptation Programmes of Action (NAPA) involving multi-stakeholders.

Another component highlighted in the framework is the exchange of **information**. Mountain areas usually face challenges in the form of lack of sufficient data and information. Better institutional arrangements in case of HP involving all relevant stakeholders can help in better exchange of information and knowledge for taking informed decisions and measures.

Investment is the fourth component of the framework that emphasizes that streamlining institutional support can enable better focus and use of available resources. Given that there will be financial gaps to address the short term and long term needs for adaptation, it will be useful for the state to use coordinated institutional arrangements for efficient utilization of existing resources as well as accessing additional resources.

BOX 1: Example of adaptation to address risks due to GLOFs in the Himalayas: NAPA in Bhutan

Hydropower resources are critical for the economy of Bhutan as they contribute 12% to the GDP of the country. Climate change, however, poses a serious threat to the resources due to the impacts of glacial melting leading to increase in flow in rivers and the potential risks of GLOFs. Thus, the NAPA of Bhutan gives priority to risk reduction due to GLOFs with identification of location specific activities. As part of the implementation project, three major activities were identified: i) artificially lowering of the water level in Thorthormi Lake, ii) Improving the capacity for disaster risk management in affected valleys, and iii) installation of an early warning system for GLOFs (UNFCCC, 2011).

A project on reduction of climate change induced risks and vulnerabilities from GLOFs has already started in the Punhakha-Wangdi and Chamkhar Valleys of Bhutan and is being implemented by UNDP. Good stakeholder participation and positive working relation among different stakeholders were utilized for the preparation of the project as well as implementation. The preparatory phase involved assessment of the country's vulnerabilities to climate change and key adaptation strategies by a taskforce comprising of member from different development sectors as well as discussion and meeting with the donors for defining and identifying key adaptation priorities and interventions. Although, the project faced some initial challenges which resulted in certain delays, it has now reached advanced stages of implementation. One of the important features of the project was involvement of local communities in the implementation process. The project also has plans of periodical review after implementation which is very important in the context of uncertainties related to climate change (UNFCCC, 2011).

This example finds relevance in case of the hilly states of India such as Himachal Pradesh which face similar risks. Since, there are a number of glaciers and glacial lakes there is potential threat of GLOFs. There have been incidents of flashfloods in the state in the past decade resulting in major losses to the economy and human lives (Government of Himachal Pradesh, 2012). The NAPA process in Bhutan provides an example of good practice of adaptation towards climate risks which can be replicated and implemented in the case of H. P. through multi stakeholder engagement, use of efficient technology and involvement of local communities to facilitate implementation.

4.2 Overcoming financial gaps

The financial gaps that are identified in the SAPCC of HP have been discussed earlier in this chapter. The first requirement to address these gaps would be to identify more detailed activities under each of the vulnerable sectors based on current and future climate trends as well as ongoing activities. In alignment to its current programmes and policies, detailed estimates of the budgetary requirements with respect to each of the proposed activities and identification of the extent of additional funding will be required. The possible funding sources need to be explored for adaptation activities. As mentioned, there are international

financial mechanisms such as the Adaptation Fund and the Green Climate Fund which can provide financial assistance for adaptation activities. The Adaptation Fund is specifically meant to support adaptation activities in the developing countries. The HP government can tap this opportunity for implementing some significant adaptation projects. It can also look for other sources of funding through different models and involve private funding sources such as the DPL.

5. Conclusion

The state of Himachal Pradesh with its immense repository of natural resources faces significant vulnerabilities to climate change impacts. The state government is taking a number of initiatives to address the challenges of climate change. The SAPCC of the state and the initiatives under the DPL from the World Bank are examples of such initiatives. Addressing the institutional and financial gaps highlighted in this document can help in achieving the states' objectives of adapting to climate change. Aligning the state's activities towards adaptation to climate change can provide benefits of green growth and sustainable development in the long term.

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About TERI

A unique developing country institution, TERI is deeply committed to every aspect of sustainable development. From providing environment-friendly solutions to rural energy problems to helping shape the development of the Indian oil and gas sector; from tackling global climate change issues across many continents to enhancing forest conservation efforts among local communities; from advancing solutions to growing urban transport and air pollution problems to promoting energy efficiency in the Indian industry, the emphasis has always been on finding innovative solutions to make the world a better place to live in. However, while TERI's vision is global, its roots are firmly entrenched in Indian soil. All activities in TERI move from formulating local- and national-level strategies to suggesting global solutions to critical energy and environment-related issues. TERI has grown to establish a presence in not only different corners and regions of India, but is perhaps the only developing country institution to have established a presence in North America and Europe and on the Asian continent in Japan, Malaysia, and the Gulf.

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