

Green Growth and Climate Change Mitigation in Himachal Pradesh

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1. Introduction

Himachal Pradesh (HP) is a northern state in India situated in western Himalayas, which covers an area of 55,673 Km, with population of 68, 56, 509 persons as per the Census of India 2011 (.57% of total population of India). The economy of the state is dependent on sectors like hydel power generation, horticulture, agriculture, forestry and tourism. The state is currently facing major challenges due to climate change particularly because:

- It is an agrarian economy with 90% rural population dependent on it for livelihood
- HP is dependent on rains for its economic activities
- Sustainability of hydro economy is dependent on snow and glaciers
- Climate induced and other natural disasters threat in the state.

Based on modeling and other studies, it is evident that the climate in the state is changing, and that there is rise in temperature in the NW Himalayan Region by about 1.6 degree in the last century. Warming rate of the city of Shimla was higher during the period 1991-2002 as compared to earlier decades and reduction in rainfall by about 17% from 1996 onwards. It is alarming that there is a sharp reduction in the monsoonal discharge of rivers in the state which can potentially impact not only HP but all other states in the country in the downstream. Erratic weather patterns have started to lead to shifting of farming practices in the state which can no longer sustain good harvest of some of the popular products produced in the state till 1990s.

Within the realization that State vulnerabilities can be reduced through proactive measures in both mitigation and adaptation, HP has taken measures to mitigate greenhouse gases (GHGs) through several initiatives discussed in the following sections.

2. GHG Emission Trends in HP

Himachal Pradesh has established the inventory of GHG emissions for its sectors and sub-sectors for gases like CO₂, CH₄, N₂O emitted as a result of anthropogenic activities at the state level from sectors like Energy, Industry, Agriculture, Waste, and Land Use Land Use Change & Forestry (LULUCF).

The source of activity data taken for deriving calculations is primary from the published documents of different organizations in the state and the studies carried out by HP State Council for Science, Technology and Environment (HPSCST&E), HP State Pollution Control Board (HPSPCB), Departments of Transport, Economic and Statistics, HP State Electricity Board (HPSEB), and Forest and Agriculture. The methodology, emission factors used in the calculations had been drawn from Indian Network on Climate Change Assessments (INCCA) country specific reference available in Intergovernmental Panel on Climate Change (IPCC) publications. After the national GHG Inventory was created in the year 2010 by INCCA, Himachal Pradesh formulated its own inventory of emissions in the state in May the same year, published in 2012. Summary of findings are given in table 1 below.

Table 1 GHG emissions from different sources in Himachal Pradesh

| S.No | Type | GHG in CO ₂ -eq (Gg) in 2009 | GHG in CO ₂ -eq (Gg) in 2012 |
|--------------|------------------------------------|---|---|
| | Electricity/Energy | 6065.49 | 5122 |
| 1 | Captive generation and consumption | 358.67 | 244 |
| 2 | Transport | 667.28 | 716 |
| 3 | Residential | 1809.72 | 1405 |
| 4 | Industrial/Commercial | 3213.98 | 2757 |
| 5 | Agriculture | 15.84 | - |
| | Industry | 5485.22 | 5512 |
| | Agriculture | 164.84 | 248 |
| | LULUCF | (-)1632.70 | (-)1685 |
| | Waste | .0061 | .003 |
| Total | | 10082.87 | 9197 |

Source: Himachal Pradesh GHG Inventory Report, 2012; Himachal Pradesh GHG Inventory Report 2014

Note: emissions/removals due to hydro power generation in the state (6.4 GW) as its contribution to clean energy is not taken into account in GHG estimation.

Table 2 Removals – Hydro Power Generation

| | GHG emissions (Gg) |
|-------------------------------------|--------------------|
| Power generation (Hydro Power only) | (-)17094.74 |

Source GHG Inventory Report Himachal Pradesh, 2014

Note: Estimated CO₂ removals are equivalent to Kwh power to be replaced by hydro power contributed to the grid.

Total emission in HP is 10.08 MtCO₂e which is 0.67% of the total GHG emissions in the country in 2009 which has come down to 9.197 MtCO₂e in 2012 according to the latest Inventory report of the government released in 2014. Carbon sinks from LULUCF in the state of Himachal Pradesh has risen over the years. While GHG emissions have come down in the overall energy sector, particularly in the transportation sector it has witness a slight increase. The contribution of other industry activities and agriculture sectors have also increased marginally, waste sector in the total emissions remain insignificant.

- The major source of GHGs emissions is bulk demand of energy from industry, commercial, tourism and development activities.
- Energy demand from residential sector is also showing need for mitigation measures in the state. Awareness generation among the people is critical.
- Cement industry in the state is also a major source of GHGs emissions. Clear strategy to address mitigation in this sector is needed.

3. Institutional Framework

The State of Himachal Pradesh has constituted a State Level Governing Council on Climate Change, under the chairmanship of the Chief Minister. The Council has broad based

representation from key stakeholders and representative line departments. The Council provides guidance on matters relating to national level negotiations including bilateral, multilateral programmes for collaboration, research and development in the state, and is responsible for coordinating national action plans on State's agenda.

An Executive Council under the chairmanship of Chief Secretary, Himachal Pradesh is also set up which is responsible for implementation and monitoring of the directives of State Governing Council on Climate Change.

The Department of Environment, Science and Technology (DEST), Himachal Pradesh is the nodal agency which coordinates all activities related to climate change. Beyond this, government would ensure that the implementation of measures at sectoral level will be the responsibility of the relevant government departments and agencies. Recently, State Center on Climate Change has been set up under HPDEST to steer state's efforts to deal with climate change.

4. Climate Change Mitigation Interventions

4.1 Policy for Climate Change, 2008

Himachal Pradesh was one of the few states to draft its own Policy for Climate Change in 2008, well before the federal directions on the State Action Plan on Climate Change was released in 2009. The policy focused primarily on roadmap for seeking the benefits of carbon credits through the Clean Development Mechanism for the State. HP is the first Indian State to sell carbon credits from community lands under the Clean Development Mechanism of UNFCCC. The bio-carbon project for expanding forestry plantations on mostly degraded land was expected to sequester nearly 800000 tonnes of CO₂ from 2006 to 2025. The Mid-Himalayan Water Shed Development Project of the government is also expected to generate Certified Emission Reductions (CERs) around 41,979 annually.

4.2 Carbon neutral state policy, 2010

In 2012, HP announced its ambition to become a carbon neutral state by 2020. Towards this endeavor the state started a programme on 'Community led Assessment, Awareness, Advocacy and Action Programme (CLAP)' for environment protection and carbon neutrality initiatives. This programme has been envisioned to assess the carbon and environment footprint at Panchayat level, the smallest unit of governance and through advocacy usher in sustainable development goals in partnership with the citizens. However, it is unclear as to how the government is planning to achieve this target.

4.3 State Action Plan on Climate Change, 2012

The State Action Plan on Climate Change (SAPCC) was prepared and endorsed by the MoEF in 2012. The state government constituted a State Level Governing Council on Climate Change (SGCCC), under the Chairmanship of Chief Minister which comprise of a broad based representation from key stakeholder departments to monitor the targets, objectives and achievements of the eight specific Missions. The Department of Environment, Science

and Technology (DEST) to the GoHP acts as the Nodal Agency to coordinate and deal with the climate change issues.

The State Action Plan on Climate Change of Himachal Pradesh is observed as part of a larger exercise to promote green growth and sustainable development in the state. It covers both mitigation and adaptation as part of the State Action Plan. At present, Himachal Pradesh's State Action Plan do not lay out specific recommendations on mitigation. The ones listed in the plan are either already in their implementation phase or are very broad in scope without concrete plans or targets. Key mitigation measures within the SAPCC are suggested for the sectors which feature prominently in the states GSDP such as solar sector, waste (waste for bioenergy), agriculture (diversification of farming systems), public transport (investments in public transport), and energy efficiency improvements in industry.

The state has put major thrust on research and development component on climate change as it recognizes that better climate research and projections would have led to more focused policies on both mitigation and adaptation. Total outlay of INR 1560 crore is estimated for implementation of all actions within the SAPCC (mitigation and adaptation). However, a clear prioritization of actions for implementation is needed. Some of the key mitigation initiatives in the state of Himachal Pradesh are given below:

State Power Policy: Himachal Pradesh is striving to meet its 100% energy needs from renewable sector. The state formulated its Power Policy to ensure sustainable development of hydropower, and also, all renewable sources in the state including measures such as biofuel plantations, solar passive designs (now mandatory), and promotion of ropeways. In order to discourage use of fossil fuels for the purpose of space heating, use of coal has been completely banned in the state. To promote solar technologies, government subsidies on purchase of solar heaters, cookers, photovoltaic cells are given. Large scale awareness building programmes are also taken up by the state agencies. In addition, government is also committed for harnessing hybrid renewable sources of energy such as the Wind Solar Hybrid System of approximately 12 KW. All these initiatives led to a sizable reduction in the GHG emissions in the state.

- 1 Energy Efficiency Programmes:** A number of energy efficiency programmes are taken up in the State which are expected to result in cumulative saving of around 500 MW in overall consumption of the energy in HP. From the 'Atal Bijli Bachat Yojna' for distribution of free CFLs to people to focused discouragement to setting-up of energy intensive industries in the state. The state has promoted ECBC and green buildings in the sector in order to address the design of new and large commercial buildings to optimize their energy demand.
- 2 Green Buildings:** The government has initiated process for brining energy efficiency and to carry out waste audit and water audits in the state.
- 3 State Policy on Transport:** The State plans to prepare a Master Plan for the Transport for HP focusing on long term transport plans to facilitate the growth of medium and small towns in ways that ensure efficient and convenient public transport in tourist

seasons. However, specific actions in this regard have not been yet established by the authorities.

- 4 **Promoting Carbon Sinks:** The State has undertaken many programmes for preserving its Himalayan ecology and enhancing the forest cover in the State with record forest cover in the year 2009 at 14,679 sq. km area covering 26.37% of the geographical area of the State. Under the Green India Mission of NAPCC, a bridge plan for INR 1.26 crore has been approved for Himachal Pradesh for the year 2012-2013. The State has taken steps to revive the traditional model of water bodies as well as to recharge the ground water and enhancing soil and water conservation. This will also help in controlling *forest fires* and act as a source of water to wild animals.

While the overall focus of the state in the context of climate change is towards adaptation, concurrent mitigation efforts are also underway in the state. Government of India has prioritized the state of HP for funding to undertake climate mitigation activities. For instance, under JNNSM, Himachal Pradesh has been identified as the special category state for higher capital subsidy availability for decentralized and off-grid solar development. The World Bank has signed a \$100 million loan agreement with the Government of India and the Government of HP towards climate smart development across key sectors energy, watershed management, industry and tourism (World Bank, 2014).

5. Future GHG emission Trend in HP

In Himachal Pradesh, power is one of the most important inputs for economic development and growth. Considering constant energy intensity for future years, the energy demand projections have been made in the State's SAPCC document.

Table 3 Future energy demand projections for the state

| Year | Future energy demand projections (in Million units) | Estimated CO2 emissions (Gg) |
|---------|---|------------------------------|
| 2010-11 | 6641 | 3923 |
| 2011-12 | 6950 | 4105 |
| 2012-13 | 7450 | 4401 |
| 2013-14 | 8150 | 4814 |
| 2014-15 | 8741 | 5163 |
| 2015-16 | 9450 | 5582 |
| 2016-17 | 10050 | 5936 |
| 2017-18 | 10850 | 6409 |
| 2018-19 | 11400 | 6734 |
| 2019-20 | 12050 | 7118 |

Source: HP SAPCC

As per the current analysis carried out in case of Himachal Pradesh, it depicts a higher emissions scenario for the state. However in the light of the carbon neutral policy for the state which came out in the same year in 2012, some disconnect between the mitigation policy land scape as well as emission scenario in the state is visible. In order to achieve the carbon neutral state in 2020, more policy interventions to reduce emissions will have to be

underplayed in the state at the earliest. Some policy directions/roadmap for HP towards this endeavor has been given in the next section.

6. Barriers, challenges and opportunities

6.1 Gaps in Understanding Climate Data

Based on the nature of available data on climate change for the state, there is clear indication on considerable gap in knowledge on climate change, lack of systemic monitoring, documentation and research in this field. The state must therefore prepare action plan to collect, process and document data to facilitate more inclusive actions on climate change in the state. There is a need to create a roadmap to update greenhouse gas emissions inventory for the state periodically as well as scenarios on mitigation assessment studies and implementable actions.

6.2 Build Capacities

A rapid building up of capacities is essential to enhance the level of climate change research in HP. In this context scientific cooperation and collaboration is essential in the area of climate modeling, impact assessment, mitigation potential and research. Extensive networking of researchers within country to carry forward the work on research is required.

6.3 Transfer of technologies

There is need for advancing sustainable development and poverty reduction through transfer of technologies that mitigate greenhouse gas emissions and enable adaptation to their expected impacts. Increasing participation in international carbon markets would be crucial for accelerating the introduction of environmentally friendly technologies in the state.

6.4 Climate Finance

Substantial climate finance beyond the targeted budgetary sources to mitigate greenhouse gases in the state would be required for if it wants to meet its carbon neutral goal by 2020, given the future projections for increase in emissions in the BAU study in State's SAPCC.

7. Ways Forward

- For the state of Himachal Pradesh, hydropower has been identified as one of the key drivers of low carbon economic growth in the state. In this pursuit, the proposal to link development of hydropower with Hydropower Generation Taxing, by the nature of its no carbon emitting resource (water) and the non-combustion way in which it captures and converts the energy into electricity. One can easily assess the annual reduction in carbon dioxide emissions and identify the potential hydropower capacity that can be developed further given the various environmental, legal, and institutional development constraints for levying the Carbon Tax in the State besides linking it with development of catchment's areas (SAPCC, 2012).

- The state also plans to develop roadmap for increased use of renewable energy, harnessing solar and wind power to meet out the energy demand from projected population growth with greater energy conservation.
- Another area of intervention in the states could be in developing its tourism sector which has been mounting pressures each year. Tourism sector which generates large extent of revenue as well as employment for the state, in an undeniable fact often have a significant adverse impact on environment, including congestion and pollution. For being the most attractive tourist destination, nearly 5000 vehicles enter Himachal Pradesh each year which has been taking huge toll on its local ecosystem. For this reason, in 2012, the government announced imposition of a 'green tax' bearing non-Himachal Pradesh numbers, in certain areas of the State. However, in recent times due to repulsions from various stakeholders, implementation of the tax is under consideration. It was estimated that nearly INR 6 crores would be collected annually from the levy, while the priority areas for its spending in protection of local ecosystem, or in adapting, mitigating climate change is not clear (SAPCC, 2012).
- The state has identified the need to expedite switch to low-energy light bulbs from traditional ones in the households. Energy saving awareness initiatives will play a key role undertaken through sustainable energy campaigns in the state.
- State has identified the need to develop a sustainable transport system that will promote economic competitiveness by removing infrastructural bottlenecks and to achieve diverse fuel mix, while increasing social cohesion, access to peripheral rural areas and reducing environmental impacts, including GHG reductions.
- Though Himachal Pradesh has extensive green cover in the state, a need is felt to formulate a separate and distinctive forest policy for Western Himalayan States in view of their vulnerability to climate change as well. There is an urgent need to develop long term monitoring plots across representative eco-zones, together with the need to map climate change driven adaptation in natural resource use and a database on carbon sequestration potential of forest flora in these areas.

8. References

Department of Environment, Science and Technology, 2012. *State Strategy and Action Plan on Climate Change*. Government of Himachal Pradesh. Shimla: 2012

Department of Environment, Science and Technology, 2012. *Greenhouse Gases Inventory Himachal Pradesh*. Government of Himachal Pradesh. Shimla: 2012

Department of Environment, Science and Technology, 2014. *Greenhouse Gases Inventory Himachal Pradesh*. Government of Himachal Pradesh. Shimla: 2014. Available at: http://desthp.nic.in/publications/ghg2014_A1b.pdf

The World Bank Group, 2014. Press release: Government of India and World Bank Sign \$100 Million Agreement to Support Himachal Pradesh in its Green Growth Agenda. 2014

TERI 2012. Delhi Sustainable Development Summit: Chief Minister's announcement on Carbon Neutral HP by 2020. New Delhi: 2012

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.

TERI possesses rich and varied experience in the electricity/energy sector in India and abroad, and has been providing assistance on a range of activities to public, private, and international clients. It offers invaluable expertise in the fields of power, coal and hydrocarbons and has extensive experience on regulatory and tariff issues, policy and institutional issues. TERI has been at the forefront in providing expertise and professional services to national and international clients. TERI has been closely working with utilities, regulatory commissions, government, bilateral and multilateral organizations (The World Bank, ADB, JBIC, DFID, and USAID, among many others) in the past. This has been possible since TERI has multidisciplinary expertise comprising of economist, technical, social, environmental, and management.



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