

Green Growth and Adaptation in India

Supported by

Global Green Growth Institute

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Suggested format for citation

T E R I. 2015

Green Growth and Adaptation in India.

New Delhi: The Energy and Resources Institute. 15 pp.

Author Divya Mohan, Associate Fellow, TERI

Email: divya.mohan@teri.res.in

Reviewer Suruchi Bhadwal, Associate Director, TERI

Email: suruchib@teri.res.in

For more information

Project Monitoring Cell

T E R I

Darbari Seth Block

IHC Complex, Lodhi Road

New Delhi – 110 003

India

Tel. 2468 2100 or 2468 2111

E-mail pmc@teri.res.in

Fax 2468 2144 or 2468 2145

Web www.teriin.org

India +91 • Delhi (0)11

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Green Growth and Adaptation in India

1. Introduction

Adaptation is one of the most prominent response strategies required to cope with climate change impacts. The Intergovernmental Panel on Climate Change (IPCC) has defined adaptation as the process of adjustment to actual or expected climate and its effects (IPCC 2014a). Actions, strategies and measures which can help in reducing the risk and vulnerabilities to climate change while increasing the coping capacity generally can be termed as adaptation. With more scientific evidence on climate variability and its impacts, adaptation to climate change has become unavoidable. One of the frequently asked questions is that how is adaptation to climate change different from traditional coping practices. 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 (Fussler 2007). Adaptation to climate change is usually planned or implemented for selected target systems at local to region scale. Another important feature of human adaptation to climate change is that it is not a well-defined and delimited set of activities and usually the adaptation activities have many dimensions in terms of domains, objectives, types and actors (*ibid*).

Adaptation has become even more significant in developing countries given the range and magnitude of diverse vulnerabilities being faced in these countries and regions. In this context, the concept of adaptation deficit finds significance which is the gap between the current state of a system and a state that would minimize adverse impacts from existing climate conditions and variability (Noble et al., 2014). In many cases this deficit is part of a larger 'development deficit' which is quite predominant in developing and least developed countries. According to the SREX report¹ (IPCC 2012), delayed mitigation and adaptation action will lead to further increase in the adaptation deficit in many cases.

Understanding the need for adaptation, many countries have initiated the process of adaptation by developing adaptation plans and policies and mainstreaming these plans with their overall development process. However, experience with implementation of adaptation is still limited and needs to be upscaled (Noble et al., 2014). As mentioned earlier, adaptation deficit are in many cases part of larger development deficits. Most of the developing countries are progressing towards a rapid development trajectory. With this rapid growth there is great potential for following a green growth path which can provide dual benefits of development as well as adaptation to climate change. It has been emphasized that differences in vulnerability and exposure arise from non-climatic factors and from multidimensional inequalities often produced by uneven development processes (IPCC

¹ Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation; read more at < https://www.google.co.in/url?url=https://www.ipcc.ch/pdf/special-reports/srex/SREX_Full_Report.pdf&rct=j&frm=1&q=&esrc=s&sa=U&ei=n8OLVevUFI6UuASv8JrgDg&ved=0CCkQFjAD&usq=AFQjCNEVsBUkCy5lcbDx59RCaWm9hZhHmg>

2014b). These differences shape differential risks from climate change. IPCC has emphasized that adaptation planning and implementation can be enhanced through complementary actions across levels, from individuals to governments (IPCC 2014b). In this context, it can be said that green growth and adaptation to climate change have direct synergies. Organisation for Economic Co-operation and Development (OECD) defines green growth as about maximizing economic growth and development while avoiding unsustainable pressure on the quality and quantity of natural assets. Efficient use and better management of natural resources can not only help in achieving green economic growth but can also facilitate in adapting to climate variability by increasing the resilience of the natural systems and the livelihoods of the communities dependent on these climate sensitive resources.

2. Adaptation need in India

India being a diverse country in terms of climate, topography, social and economic factors, it is also facing a number of challenges with respect to climate change. Past observations indicate that the annual mean temperature of India has showed significant warming trend of 0.51°C per 100 year, during the period 1901–2007 with increased warming during 1971–2007 (Kothawale et al. 2010; INCCA 2010). This warming is mainly contributed by the winter and post-monsoon seasons, which have increased by 0.80°C and 0.82°C in the last hundred years respectively. The pre-monsoon and monsoon temperatures also indicate a warming trend (INCCA 2010). Projections for 2030 also indicate a warming trend for the Indian sub-continent.

Being heavily dependent on climate sensitive sectors and resources for livelihoods and economy, India faces an urgent need of adapting to the risks faced by climate variability. Key natural resources including water, land, forest and biodiversity are already facing impacts of climate change. Agriculture, which supports the livelihoods of millions of people in India, contributes nearly 17.1% of gross domestic product (GDP) of the country. Climate variability and extreme climate events adversely affect agricultural production and the livelihoods of the farmers. Past observations have indicated decline in crop production due to temperature increase and extreme events in India. Without adaptation, there might be a loss of 10-40% in crop production in India by 2080-2100 inspite of benefits from increased level of CO₂ (INCCA, 2010). Ecosystems are also very sensitive to climate variability and some of the impacts are already visible in case of India. Shift in the arrival of monsoon, long winter dry spells (5–6 months as experienced in 2008–09), increased frequency of forest fires during winter, the early flowering/fruited of native trees, such as Rhododendron have been observed in the Indian Himalayan Region (IHR) (INCCA, 2010). Water which is a critical resource is likely to be adversely impacted in terms of effect on water balance due to change in pattern of precipitation and evapotranspiration. Increased frequency of heavy rainfall events may result in higher runoff. Urban areas and cities of India which are rapidly developing are also vulnerable to the impacts of climate change due to inadequate infrastructure and high population density. Climate change may also cause health impacts including direct impacts such as heatstroke or increased mortality due to droughts or floods as well as indirect impacts such as increased risk of vector borne diseases. These impacts will also have financial implications for the country. A study by ADB (2014) estimated that

by 2050, annual GDP losses for India under the business- as-usual (BAU) scenario are projected to be about 1.8%. The adaptation cost estimated for India for 2030s is USD 7,797.8 million and for 2050s is USD 21,456 million (ADB, 2014).

Due to rapid development, India is already facing a number of non-climatic stressors and the risks due to climate variability will aggravate the vulnerability of the country. However, in this context, India has already started taking initiatives to address these climate risks. According to the second National Communication to United Nations Framework Convention on Climate Change (UNFCCC) on climate change (NATCOM, 2012) the development plans of the country have been designed with balanced emphasis on economic development and environment guided by the principles of sustainable development. This also highlights the potential to integrate and implement adaptation in development pathway of the country.

3. Policy landscape for adaptation in India

In 2008, India released its National Action Plan on Climate Change (NAPCC) which comprehensively aims to take actions for mitigation and adaptation to climate change. The NAPCC is guided by the principles of sustainable development stressing on the fact that development of the country is the key objective while addressing the risks of climate change. Protection of the poor and vulnerable sections of society through sustainable development strategies is one of the most important priorities mentioned in the plan. There are eight missions under the NAPCC out of which four directly relate to adaptation including the National Water Mission, National Mission for sustaining the Himalayan Ecosystem, National Mission for a Green India and National Mission for Sustainable Agriculture (NAPCC, 2008). The National Mission on Sustainable Habitat relates to both adaptation and mitigation strategies primarily in urban regions. For each of the missions a detailed mission document has been prepared outlining the key challenges, proposed strategies and actions, specific activities and implementing agencies. Currently, all the missions have been approved by the Prime Minister's Council on Climate change. Table 1 gives indicative financial requirement for the missions pertaining to adaptation under 12th Five Year Plan. The NAPCC clearly underlines the fact many of the measures mentioned are already being planned or implemented as part of the ongoing programmes and schemes but these need to be modified in the context of climate change.

Table 1 National Missions related to adaptation (with their financial requirement under 12th Five Year Plan) and progress achieved

| Mission | Objective | Financial requirement for 12 th Plan period | Progress achieved till now |
|--|---|---|---|
| National Mission for Sustainable Habitat | Promote energy efficiency in buildings, management of solid waste, and modal shift to public transport, including | Funding requirement assessed to be INR 950 crore for the 12 th Five year plan period; to be met from the existing budget of the Jawaharlal Nehru | <ul style="list-style-type: none"> NMSH standards developed for six sub-sectors, namely (a) solid waste management, (b) water and sanitation, (c) storm water drainage, (d) urban planning, (e) energy efficiency, and (f) urban transport for integration in developmental activities in the state. |

| Mission | Objective | Financial requirement for 12 th Plan period | Progress achieved till now |
|--|--|---|---|
| | transport options based on biodiesel and hydrogen. | National Urban Renewable Mission | <ul style="list-style-type: none"> • Energy Conservation Building Code 2007 made mandatory for new as well as old buildings and incorporated in the Central Public Works Department (CPWD) general specifications for electrical works in 2013. • Green building norms made mandatory for the CPWD since 2009 and incorporated in the CPWD Works Manual 2012. |
| National Water Mission | Conservation of water, minimizing wastage, and ensuring more equitable distribution both across and within states. | Budgetary support of INR 89,101 crore required; currently, proposals for INR 196 crore have been approved | <ul style="list-style-type: none"> • A pilot study of basin-wise water done for two basins, viz. Godavari and Brahmani-Baitarani. The studies are being extended to all the basins. • An MoU signed between the Ministry of Water Resources and Asian Development Bank for technical assistance with the objective of undertaking operationally relevant research for identifying and testing integrated flood mitigation and flood plain management strategies. • Revised National Water Policy (2012) adopted by National Water Resources Council • Created 1,082 new Ground Water Monitoring Wells |
| National Mission for Sustaining the Himalayan Ecosystems | Management measures for sustaining and safeguarding the Himalayan glacier and mountain ecosystem | Funding requirement estimated to be INR 1,695 crore; proposals for INR 500 crore have been approved. | <ul style="list-style-type: none"> • Mapping of all R&D Institutions (over 100) and community based organizations (over 250) completed • 6 thematic task forces finalized in the region • State level climate change cell/ centre being set up and strengthened • A National Centre for Himalayan Glaciology being set up in Mussoorie • Several Training programmes initiated • Action on developing regional cooperation framework being initiated with International Centre for Integrated Mountain Development (ICIMOD) |
| National Mission for a Green India | Enhancing ecosystem services and carbon sinks through afforestation on degraded forestland and expansion of forest and tree cover. | Total cost estimated to be INR 46,000 crore; an amount of INR 13,000 crore has been approved for implementation of various activities under the Mission | <ul style="list-style-type: none"> • About 10 states have already submitted their perspective plans to be taken up in 33 landscapes over a working area of around 0.85 lakh ha • Preparatory activities underway in 27 Indian states |

| Mission | Objective | Financial requirement for 12 th Plan period | Progress achieved till now |
|--|--|--|---|
| National Mission for Sustainable Agriculture | Ensuring food security and protecting land, water, biodiversity, and genetic resources for sustainable production of food. | INR 1,08,000 crore required till the end of the 12 th Five year plan period; proposals for Rs. 13,034 crore have been approved so far | <ul style="list-style-type: none"> • Developed 11,000 hectares of degraded land • 1 million hectares brought under micro-irrigation to promote water efficiency • Created 5.4 million metric tonne agricultural storage capacity • Given the availability of funds, 15 deliverables are proposed for implementation under the mission including horticulture area expansion, agriculture market creation of storage and increase in fish production |

Source: Ministry of Finance, GoI, 2014; DST, 2014; TEDDY, 2013; MoEFCC, 2014b

For accomplishing the actions proposed in the NAPCC and its missions at sub national level, the state Governments were asked to prepare their respective State Action Plan on Climate Change (SAPCC) in consistency with the NAPCC. A common framework guiding the broad process of preparation of SAPCC was developed focusing on planning at state level, capacity building for vulnerability assessment and identifying investment opportunities based on state's priorities (MoEFCC, 2014b). As of now, 30 states and union territories have prepared their respective SAPCCs outlining the key vulnerabilities and identified mitigation and adaptation strategies (MoEFCC, 2014b). The expert committee on climate change under MoEFCC has reviewed and endorsed 19 of these SAPCCs (MoEFCC, 2015). A combined budgetary requirement of INR 11.32 lakh crore (USD 188.66 billion) has been assessed for implementation of SAPCCs (MoEFCC, 2014b).

The institutional structure for implementing response mechanisms towards climate change in India has the Prime Minister's Council on Climate Change chaired by the Prime Minister of India at the centre. The council was constituted in 2007 and reconstituted in 2014 to coordinate national action for assessment, adaptation and mitigation of climate change. It provides the overall guidance to climate change related actions taken by various Ministries in the Government and other agencies (Planning Commission, 2011). There have been several recent initiatives taken by the Government in order to address climate change needs. Some of these include:

- The National Adaptation Fund which was announced in the financial budget for the year 2014-15 with an allocation of 200 million US dollars (INR 100 crore). The allocation was raised to INR 160 crore in the union budget for 2015-16.
- The "100 Smart Cities" initiative with a total allocation of USD 1.2 billion, will involve integrated policies for adaptation and mitigation to reduce the vulnerability and exposure of urban areas to climate change.
- The government is also taking measures for cleaning the River Ganga which is expected to yield multiple benefits of pollution reduction and climate adaptation (MoEFCC, 2014 c).

In the international context, the Indian government has emphasized on its priority of economic and social development and poverty eradication while placing a high value on the environment and maintenance of ecological balance. The principle of equity is one of the underlying principles of India's plans on addressing climate risk. The principle of 'achieving national growth objectives through a qualitative change in direction that enhances ecological sustainability, leading to further mitigation of greenhouse gas emissions' clearly highlights the government's objectives of moving towards a green growth trajectory (NAPCC 2008).

Particularly, in the context of adaptation, the Government of India in its communication to UNFCCC on climate change negotiations highlighted that augmenting the implementation of adaptation is significant for India due to its vulnerabilities and identified a set of core principles for attaining this objective. These include the principle of equity, and the principle of common but differentiated responsibilities and respective capabilities under the convention (MoEF 2009). It also talks about establishing new, additional and predictable financial resources that are supported by appropriate institutional mechanism and building access to means of implementation including finance, technology, capacity building, and knowledge sharing for adaptation at national, sub regional, regional and international levels. It recognizes that implementation of adaptation actions should take into account diverse and specific characteristics of different levels of vulnerability assessments including gender sensitivity as integral part of adaptation actions (MoEF, 2009). The document mentions that generation of resources for adaptation should be guided by the concepts of adequacy, predictability and automaticity (MoEF 2009).

In the 20th session of Conference of Parties (COP) of the UNFCCC held in Lima in 2014, the MoEFCC reiterated that India will be focusing on action-oriented policies to bring rapid development in India while also addressing climate change. It was emphasized that the development of the people and provision of basic services such as healthcare, water, sanitation, education and employment are the priorities of the Government but adaptation is critical for a developing country like India and the country is taking measures to address the challenges of climate change. It communicated India's stand on adaptation and the urgent need to address adaptation in the post-2020 agreement on climate change under the UNFCCC.

4. International provisions for adaptation

There is growing recognition globally that adaptation is inevitable and there is a need for enhanced action on adaptation. In the COP held at Cancun in 2010, the countries, party to the convention, stressed that adaptation needs to be addressed with the same priority as mitigation. The Cancun Adaptation Framework was also adopted in Cancun which emphasized action on adaptation through regional cooperation. To address the challenges of climate change, adaptation is one of the most important responses and at international level, UNFCCC has supported action on adaptation. Since UNFCCC is one of the most important entities globally on climate change, it has been playing a significant role in facilitation of adaptation.

There are a number of bodies which have been formulated to facilitate adaptation in the countries (Annexure 1), particularly the developing and the least developed countries (UNFCCC 2013a). These include:

- The Least Developed Countries Expert Group (LEG) for providing technical guidance and support to the National Adaptation Planning (NAP) process;
- The Adaptation Committee for promoting the implementation of enhanced action on adaptation in a coherent manner under the Convention
- The Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) for assisting the non-Annex I Parties with the process of preparing national communications.

There are also specific programmes which have been formulated for supporting action on adaptation globally (Annexure). Some of these have been discussed below:

- The Nairobi work programme on impacts, vulnerability and adaptation to climate change (NWP), which has been specifically initiated to support the countries, in particular developing countries. This aims at improving the understanding and assessment of impacts, vulnerability and adaptation to climate change; and to accordingly improve the decision making process based on practical adaptation actions and measures to respond to climate change)
- The Warsaw International Mechanism on loss and damage has the objective of looking at the approaches to address loss and damage associated with climate change impacts in developing countries).
- The LDC work programme is for assisting the Least Developed Countries (LDCs) in dealing with problems associated with adaptation to climate change.
- National adaptation Programmes of Action (NAPAs) have been initiated as an element of the LDC work programme for providing a process for the LDCs to identify priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change.

These programmes and committees help in providing a process and technical guidance to the countries, in particular the developing countries for identifying adaptation needs and priorities, planning and implementation of adaptation. For instance, the adaptation committee plays an important role in facilitating a shared learning process on adaptation globally by exchange of information, knowledge and good practices among different countries. Similarly, the NAPAs are focused programmes specific to the country context and are action oriented for effective response to immediate adaptation needs. They also provide a simple format to policy makers for prioritization of activities and for project proposal development (UNFCCC 2013a). Through these mechanisms, the convention helps in supporting the countries in the adaptation process in terms of technical guidance, facilitation of financial and technical support and stakeholder engagement at a wide scale.

At national level, several countries have made progress in the context of taking action on adaptation. According to IPCC AR5 (2014), progress has been made in terms of development of adaptation plans and strategies at national, regional and community level. Although there is still limited evidence of adaptation implementation, community based adaptation has gained prevalence in developing countries to address local vulnerabilities (Noble et al., 2014). Recognizing the significance of adaptation to respond to climate risks, more emphasis is being given to understand the enabling conditions to augment adaptation action. These include technological interventions, financial strategies and institutional support.

4.1 Technological interventions

One of the most important requirements for facilitation and implementation of adaptation is technology in the form of material, equipment and knowledge. According to UNEP (2014), technologies for climate change adaptation have the potential to play a substantial role in improving social, economic, environmental, and management practices in sectors vulnerable to climate change. At an international level, the attention towards need and role of technologies for climate adaptation and risk mitigation has been increasing and this is evident from the activities under the UNFCCC (CTCN 2014; UNFCCC 2013a). Under the UNFCCC, the Technology Mechanism was established in the 16th session of COP 16 held in Cancun. This mechanism essentially has two components - the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN), both mandated to facilitate the effective implementation of the Technology Mechanism. Being the policy component of the Technology Mechanism, the major functions of the Technology Executive Committee (TEC) includes consideration and recommendation of actions for supporting technology development and transfer in order to accelerate action on mitigation and adaptation (UNFCCC, 2014c). The second component, CTCN, is to encourage technology cooperation and to further augment the development and transfer of technologies, especially assisting the developing countries in this context.

Under these technology mechanisms, there are tools which have been developed to facilitate the process. One of them is Technology Needs Assessment (TNA) which is a planning tool for developing and implementing policies and measures for the development and transfer of environmentally sound technologies. The TNA provides a systematic process (Figure 1) to be followed for identification of technologies for mitigation and adaptation while also addressing development needs (UNFCCC 2013b).

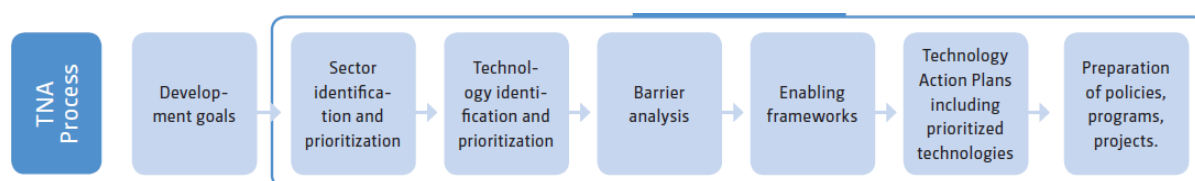


Figure 1 Technology Needs Assessment (TNA) process

Source: UNFCCC (2013)

As suggested by UNFCCC, these TNAs can be easily integrated with NAPAs as there are synergies with the overall process of NAPAs and TNAs. The process of NAPAs includes identification of specific needs and priorities at national level along with the consideration of

sustainable development objectives and plans (UNFCCC, 2013 (b)). These mechanisms can help in overcoming some of the technological barriers related to implementation of adaptation in India.

The mechanisms of technology transfer under CTCN will be channelized through the National Designated Entity. 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).

4.2 Financing strategies

According to a study done by World Bank, the cost estimates for adaptation to a 2°C rise in global average temperature between 2010 and 2050 is in the range of US\$70 billion to US\$100 billion a year (World Bank 2010). However, a recent report by UNEP (2014) has mentioned that there is not much confidence in the numbers of these estimates and mentions that these numbers are an underestimation due to a number of factors. In another assessment done by UNFCCC (2007) the total funding need for adaptation by 2030 was estimated to US\$49 – US\$171 billion per annum globally, of which US\$27 – US\$66 billion would be in developing countries. A critique done by Parry et al., 2009 however found these numbers to be an underestimation of the required cost which could improve by more detailed studies of adaptation options. Based on previous analysis and other studies, the UNEP report (2014) has estimated that the cost of adaptation for developing countries, could be between US\$150 billion/year by 2025/2030 and USD 250 billion to USD 500 billion/year by 2050 although it mentions that it is very challenging to give an accurate and exact estimation of adaptation cost required. It is imperative that planning and implementation of adaptation in the current scenario is required and any further delays will only aggravate the impacts and cost of adaptation to climate change.

As climate change impacts and vulnerabilities differ across regions, the coping capacity also varies and this applies to financial capacity as well. Under the UNFCCC, a financial mechanism has been established to facilitate financial assistance from developed to the developing countries (UNFCCC 2014a). As part of this mechanism developed countries are required to provide new and additional, adequate and predictable financial resources to developing countries. The operation of this mechanism is partly assigned to the Global Environment Facility (GEF). In addition to providing guidance to the GEF, four special funds have been established: the Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF), both managed by the GEF, and the Green Climate Fund (GCF) under the Convention; and the Adaptation Fund (AF) under the Kyoto Protocol. At the 17th session of COP, the GCF was designated as an operating entity of the financial mechanism. The objective of the GCF is to give support to developing countries for reducing GHG emissions and for adaptation thereby fulfilling the objectives of the convention. Currently, many developed countries have pledged funds towards the GCF. In November 2014, the United States and Japan announced a total of up to USD 4.5 billion in pledges to the Green Climate Fund (GCF). This includes up to USD 3 billion from the United States and up to USD 1.5 billion from Japan, subject to respective domestic procedures and based on strong

contributions from other donors. Australia pledged Aus\$200 million (USD 165 million) to the UN-backed Green Climate Fund to mitigate the impact of global warming on poor countries (UNFCCC 2014a). The adaptation fund, which is financed with a share from the clean development mechanism (CDM) project activities and other sources of funding, is in particular meant to finance concrete adaptation projects and programmes in developing country.

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

4.3 Institutional framework

According to IPCC AR 5 (2014) institutions are pivotal for implementing adaptation actions. Institutional weaknesses, lack of coordinated governance, and conflicting objectives among different actors can be major constraints for adaptation (Noble et al., 2014).

At the international level, institutional arrangements can provide three main areas of support for national adaptation action – i) policy recommendations and/or advance the political agenda; ii) scientific information and guidance; and iii) financial, technical and capacity building support (UNFCCC 2014b). Institutional arrangements can help in integrating adaptation into the overall development process, in getting the relevant stakeholders involved in adaptation, in better exchange of information, and getting investments (UNFCCC 2014b). At the country level, there are different types of institutional arrangements in developing countries and many countries have developed specific institutional frameworks dedicated to combating climate change such as inter-ministerial climate change coordination committees, technical working groups undertaking specific studies on inventories, mitigation, vulnerability and adaptation, and climate research centres coordinating national studies.

The Climate Change Division of MoEFCC is India's nodal agency for climate change cooperation and global negotiations. It is also the nodal unit for coordinating the National Action Plan on Climate Change in the country. International cooperation on technology and finance for adaptation is also channelized through MoEFCC. For instance, the nodal agency

for facilitation of financial mechanisms in the country such as the GCF and AF as well as for technology transfer mechanisms is MoEFCC.

The Prime Minister's Council on Climate Change chaired by the Prime Minister of India at the centre constituted in 2007 and reconstituted in 2014 is primarily to coordinate national action for assessment, adaptation and mitigation of climate change. The group has the following objectives:

- (i) Coordinate national action plans for assessment, adaptation and mitigation of climate change.
- (ii) Advise government on pro-active measures that can be taken by India to deal with the challenge of climate change.
- (iii) Facilitate inter-ministerial coordination and guide policy in relevant areas. (MoEFCC, 2014)

5. Barriers

Although there has been substantial progress in adaptation planning through the NAPCCs and SAPCCs, implementation of adaptation strategies is still very limited in India and has been limited to pilot projects. India, like any other developing country, has huge dependence on climate sensitive sectors which makes adaptation even more challenging. Some of these constraints include:

Financial: One of the key constraints is lack of adequate funds to address current and future adaptation needs. The current available funding for adaptation is very limited as compared to the cumulative budgetary estimates identified for the implementation of SAPCCs which are substantially high. This constraint is even more compounded at the local level as local Governments often face lack of adequate funds to implement the planned development activities and plans.

Institutional: Since adaptation is local and context specific it is important to match the appropriate institutional scale with the scale of implementation. Most of the planning with respect to climate change adaptation is at present at the state level. In order to facilitate implementation of adaptation strategies, there is a need to take the adaptation process to a more micro level. However, local governments often face several challenges including coordination among departments and allocation of limited resources which become constraints for adaptation implementation.

Knowledge gaps: One of the major knowledge gaps in implementing adaptation is the uncertainty associated with climate change impacts. Future uncertainty acts as barrier in decision making as the current identified adaptation strategies might no longer be useful in a future scenario thus leading to aggravated vulnerability or maladaptation.

6. Ways Forward

India is currently taking a number of steps in moving towards adaptation. A roadmap for climate change in India would mean strengthening the current mechanism being utilized and also taking into account the opportunities and support available from international mechanisms and regional cooperation.

- India has already taken initiatives with respect to adaptation planning in terms of NAPCC and SAPCC. However, there is a need to devise mechanisms for planning and implementation at micro levels in order to efficiently address adaptation needs.
- Strengthening the capacity of local governments for adaptation planning and implementation can help in facilitating adaptation in India and making the communities more resilient. This will also help in addressing the institutional constraints faced at the local level and will help in integration of adaptation in local development process.
- There have been a number of pilot adaptation projects implemented across the country and there is a great potential to assess the learnings from these projects and find ways of up-scaling such initiatives for building resilience of the communities in wider context. The NAPA process in least developed countries also identifies such best practices in adaptation which can be useful in guiding the adaptation planning and implementation in the country.
- Utilization of technology mechanisms available at the international context such as the Climate Technology Centre and Network (CTCN) can be helpful for transfer of efficient technology for mitigation and adaptation to impacts of climate change. As discussed earlier, its primary objective is to support developing countries in enhancing their clean technology capabilities and facilitating prompt action on the deployment of existing technologies. This mechanism can facilitate better use of technologies for adaptation and mitigation.
- Although, the Government of India has been allocating funds for adaptation under the National Missions as well as the SAPCCs, action on adaptation would require additional funds from other sources. The funding mechanisms available from international sources can be accessed to meet this requirement. 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. Apart from these, other sources such as funding from bilateral and multilateral funding agencies as well as private sector also need to be explored to meet the financial demands for adaptation.

Annexure 1: Institutional agencies and programmes under UNFCCC related to adaptation and their relevance to India

| Adaptation body | Function | Relevance to India | How can India benefit from these agencies |
|---|---|---|--|
| Institutional agencies under UNFCCC | | | |
| Least Developed Countries Expert Group (LEG) | To provide guidance to LDCs on the preparation and implementation of national adaptation programmes of action | Adaptation programmes being prepared and implemented in LDCs will also be relevant for India in terms of gaining knowledge | Learning through implementation experiences in LDCs through south-south cooperation |
| Adaptation Committee | To promote the implementation of enhanced action on adaptation in a coherent manner under the Convention, inter alia, through various functions | As India is moving ahead with planning and implementation of its adaptation programmes, the support and guidance from the committee will be useful | Beneficial for India in facilitating the implementation process of adaptation in terms of technical guidance and sharing of relevant information, knowledge, experience and good practices from other regions and countries |
| Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) | To improve national communications (NCs) from developing country Parties through technical advice and support | Technical assistance for India in meeting the reporting obligations on National Communication. | Guidance in better and robust reporting of National communication |
| Programmes under UNFCCC | | | |
| The Nairobi work programme on impacts, vulnerability and adaptation to climate change (NWP) | Support the countries, in particular the developing countries, to improve their understanding and assessment of impacts, vulnerability and adaptation to climate change; and to accordingly improve the decision making process based on practical adaptation actions and measures to respond to climate change | It provides a mechanism to not only address different challenges related to adaptation but also promotes mutual learning, collaboration and knowledge sharing between different member parties facing similar challenges of vulnerability | The programme can be of great significance for India as it provides an opportunity to gain knowledge from adaptation experiences from other regions. This can impart substantial guidance to the adaptation process in India |
| Warsaw International Mechanism on | To address loss and damage associated with impacts of climate | The mechanism is targeted to support implementation of | The mechanism can help in enhancing knowledge on risk management |

| Adaptation body | Function | Relevance to India | How can India benefit from these agencies |
|--|--|---|---|
| loss and damage | change, including extreme events and slow onset events, in developing countries | approaches to address loss and damage in developing countries like India | approaches, tools and best practices in the context of loss and damage through sharing of information between relevant stakeholders and support in terms of finance, technology and capacity building |
| LDC work programme | To assist the Least Developed Countries (LDCs) in dealing with problems associated with adaptation to climate change | Learning from the experiences of LDCs | Learning from the experiences of LDCs in implementing adaptation |
| National adaptation programmes of Action (NAPAs) | To provide a process for the LDCs to identify priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change | NAPA process is relevant for India as well as it provides a systematic process of adaptation implementation | The NAPA process in LDCs can serve as guides for adaptation in India through case studies and best practices. |

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