ICAT Country Needs Assessment Report

INDIA

INITIATIVE FOR
Climate Action
Transparency

Developed by:
The Energy and Resources Institute (TERI)

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1. Introduction

1.1. India's National Circumstances

India constitutes 2.4 % of the world's surface area, supporting a population of nearly 1.2 billion. While the country struggles to grow and is recognized as a large developing country, it houses a large proportion of the global poor nearly 30 % and millions without access to basic services including safe drinking water, electricity and decent cooking facilities. India ranks 135 in the Human Development Index indicating the huge gap that remains to provide a quality life to its citizens.

Though the country is realised to be one of the fastest growing economies of the world, it does not capture the large disparity in growth that exists within the country across people and regions. There are hundreds of millions of people who live in abject poverty even today although poverty rates are reported to be declining. There is uneven development visible across regions within the country and between the urban and rural areas further increasing the divide the between the comparatively rich, well to do and the poor.

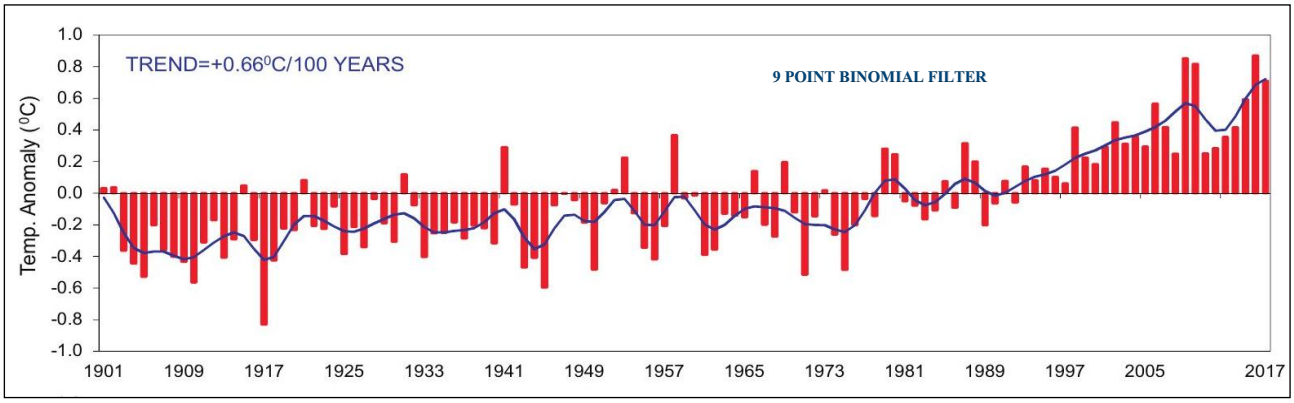
Keeping the above India's national circumstances presents huge developmental challenges to it as it strives to grow in the 21st century.

1.2. Climate Change Context

Lying in the tropics, a large country with two-thirds of its area as semi-arids, India is increasingly exposed to the challenges of climate variability and climate change. Its geographical location along with exposure to high climatic variability - changes in weather patterns including increase in temperature, variation in rainfall and sea level rise makes India the most climate-sensitive region in South Asia (Patra, 2016). Around 5,700 kms of the country's coastline is prone to cyclones and tsunamis; over 12% and 68% of its cultivable area is vulnerable to floods and droughts, respectively ("Vulnerability Profile of India", n.d). Historically speaking many areas within the country have been experiencing drought conditions, floods and are exposed to cyclonic events, the nature of these events have been changing and continues to change as frequencies and intensities of these events have increased. A huge proportion of its population is thus exposed and vulnerable to these changes as many are reliant on climate sensitive sectors including agriculture and its allied sectors for a living. Exposures to extremes have resulted in huge damages to life, property and other infrastructure. With a large feeding population of 1.3 billion, millions of people are directly or indirectly affected every year given the consequences of a changing climate.

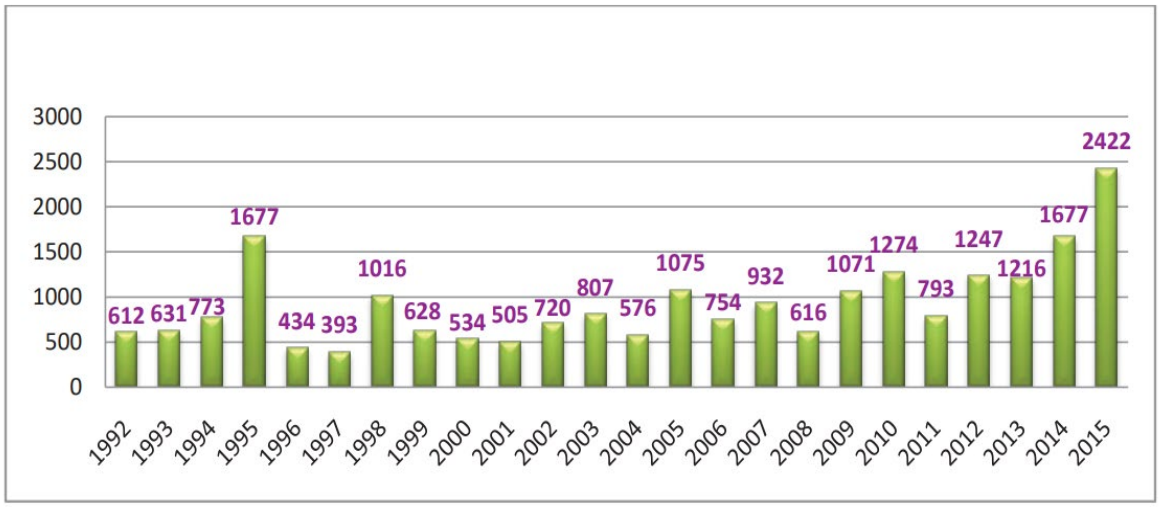
The past few years have observed a significant rise in the temperatures in the country. The all-India annual mean temperature anomalies for 1901–2017 based on the 1971–2000 average (Figure 1) clearly show a warming trend of +0.66°C every 100 years (IMD, 2017). The rise is more prominent in the minimum temperatures as compared to the maximum temperatures and this has created heat stress conditions. The 15 year time span between 2003 and 2017 saw 11 warmest years (Ibid).

Figure 1: All-India annual mean temperature anomalies for 1901–2017 (based on the 1971–2000 average)



Rising episodes of heat waves have led to a concomitant increase in cases of associated morbidity and mortality (Figure 2). It is expected that the extent and the intensity of heat waves in India will increase in the years to come given the already existing high temperatures observed (Murari et al, 2015).

Figure 2: Rising number of heat wave deaths since 1992



Source: Guleria and Gupta (2018)

India's second national communications (SNC) indicates that temperatures would continue to increase and projections highlight an increase of 3.5°C to 4.3°C by the end of century (MoEF, 2012). The INCCA Report highlights increase in precipitation in future time periods to the tune of 3 to 7 % by 2030s compared to the 1970s (INCCA, 2010). This regional assessment highlights that the frequency of rainy days is expected to decrease over North-India but intensities would increase especially in the mountain regions and coastal regions. Likewise, the frequency of cyclonic storms is expected to lessen over the Arabian Sea but, the intensity of the storms will significantly rise under the warming scenario. These future climate projections reflect the urgent need to address climate change in India and the necessity for adapting to the anticipated climate change impacts well in advance.

The cross-sectoral linkages and dependencies will have further impact on the livelihoods of the people For instance, since a majority of India's population is dependent on agriculture and forestry for its livelihood, a change in the pattern of water availability can reduce productivity of crops and lead to loss of livelihoods. The impact of various sectors is explained below:

Agriculture

According to India's Second National Communications, a rise in in atmospheric CO_2 can directly affect the yield of crops. For instance, the yields of many crops are likely to decrease as most of these crops are known to be grown already at higher temperature thresholds. Horticultural crops like apple are likely to be affected due to rise in temperatures. With 67% of India's net sown area being dependent on rainfall, the erratic rainfall patterns and the resultant extreme events has been causing crop losses and will continue so (Venkateswarlu, 2019). Pronounced impacts on rainfed areas are expected compared to irrigated areas (Economic Survey, 2017-18).

Water

India has only 4% of the world's fresh water resources despite having approximately 17% of the world's population (MOEFCC, 2018). Therefore, changes in the key climate variables like temperature, precipitation and humidity will have significant long-term implications on the quality and quantity of water (NATCOM, 2012). The overall impact of climate change on water is predicted in terms of increase in the occurrence of extreme events, thereby escalating the flood and drought frequency, intensity of rainfall and spatial variability. Rise in global temperature is expected to raise the sea level, which in turn will change the sea water-fresh water dynamics. This may have an impact on outflow of fresh ground water into the sea and vice versa. For instance, changes in the flow of the largest river system in India, the Ganga Brahmaputra- Meghna system could have a substantial bearing on irrigation, in turn affecting the amount of food being produced in this basin as well as livelihoods of millions of people (MOEFCC, 2018). Irrigation may further get affected with declining groundwater levels in almost 54% of the wells across India which in turn will impact the groundwater dependent farming communities (Shiao et al., 2015).

Forests

The Indian forests are already exposed to multiple pressures including livestock grazing, over extraction, insect outbreak, forest fires and other anthropogenic stresses and climate change may aggravate the situation further. Incidences of forest fires are a likely area of concern. Impacts on the Net Primary Productivity of forests are likely to be felt.

Coastal Areas

India has a long coastline of nearly 7,500 km and the coastal region account for 78 districts in the nine maritime states (MOEFCC, 2018). A major portion of the population living along the Indian coastline is reliant on climate-dependent activities like marine fisheries and agriculture. Thus, because of its sensitive topography, the coastal regions are highly vulnerable to storm surges and extreme cyclonic conditions. India's eastern coast is far more vulnerable to such incidences compared to its western coast (INCAA, 2010).

Health

The World Health Organization (WHO) cautions that the risk of death and disease from climate change will double in the following 20 years. India is a highly populous country and is experiencing industrialization, with rural to urban migration increasing at a greater scale. The National Action Plan on Climate Change and Human Health (2016) mentions that changes in temperature and precipitation and occurrence of extreme weather events (like heat waves, floods and droughts) are likely to deteriorate health of workers and lead to the loss of wages. With an expected increase in the intensity of heat waves in India, the impact might become even worse leading to an increase in the incidences of heat stress and heat related mortalities (Murari et al, 2015). Ecological disruptions, changing temperatures, rising sea level and, variation in precipitation patterns lead shift in the pattern of vector borne and water borne diseases etc. further affecting health.

2. Climate Change Responses and Priorities

A large agrarian society, still in its developing stages, India is highly vulnerable to the impacts of climate change. Adaptation is a necessity to reduce the drastic effects of climate change including impacts on human health, agriculture and water resources. While national and sub-national goals are being set for addressing climate change, India also has a firm commitment to international processes in place that indicate addressing these challenges.

India's focus has been on both mitigation and adaptation as also indicated in its nationally determined contributions (NDCs). However, so far the agenda on mitigation that has been outlined is far clearer than in the case of adaptation. Section below indicates India's priorities at a global, national and sub-national scale.

2.1 National Responses and Priorities

Global scale - NDC priorities, and links to the SDGs

India has signed and ratified the Paris Agreement making it obligatory for it to reach its commitments. Also, India is a signatory among 192 nations to the 2030 Global agenda for Sustainable Development. India's NDC suggests that its contributions take into account its capacity to achieve the SDGs; however, the two processes have largely operated in silos. Different institutional, policy and administrative processes and different actors have been utilized to translate these global agreements into national actions. The Ministry of Environment, Forest and Climate Change (MoEFCC) has designed the NDCs with consultations from state governments, ministries and civil society. The NDC takes into account India's historical commitment to conservation of nature as well as the imperatives of meeting the competing demand of resources for addressing the challenges of poverty eradication, food security and nutrition, universal access to education and health, gender equality and women empowerment, water and sanitation, energy, employment and sustainable urbanisation; making it among the most over-arching NDCs in the world. On the other hand The Government of India has entrusted NITI Aayog, to coordinate the SDG Agenda in the country. NITI Aayog has carried out draft mapping of goals and targets against existing schemes-

these goals have been assigned to respective ministries. There is also action at the state level, with states asked to put forward their plans for implementing the SDGs to NITI Aayog, looking at the SDGs as a guiding framework for their long term development strategy. This includes a proposal to introduce an SDG charter for each government ministry. The MoEFCC has been assigned the responsibility of three goals (Goal 12, 13 and 15) directly where they need to coordinate with different ministries on individual targets. Further, they have partial responsibility of another seven Goals for which they will engage with other ministries.

For a country like India, progressing towards the two agendas of sustainable development and climate actions cannot be seen as distinct and in fact would serve as a win-win situation when approached together (Development Alternatives,

Highlights of India's NDC for the period 2021 to 2030 (Government of India,2015):

1. "To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation.
2. To adopt a climate friendly and a cleaner path than the one followed hitherto by others at corresponding level of economic development.
3. To reduce the emissions intensity of its GDP by 33 to 35 % by 2030 from 2005 level.
4. To achieve about 40% cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance including from Green Climate Fund (GCF).
5. To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030.
6. To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.
7. To mobilize domestic and new & additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.
8. To build capacities, create domestic framework and international architecture for quick diffusion of cutting edge climate technology in India and for joint collaborative R&D for such future technologies."

2016). The alignment of these two agendas is imperative to reduce duplication and increase efficiency - maximizing resources, technical capacity, information, and expertise sharing (UNDP, 2017). Therefore, understanding the linkages at the action level is key for evidence-based decision-making in safeguarding the marginalised and vulnerable communities from climate change impacts while simultaneously developing sustainably through minimum carbon emissions.

A number of detailed studies or initiatives/exercises till date have mapped how specific mitigation and adaptation actions can impact the SDGs; interrelationships, synergies, and trade-offs between Agenda 2030 and countries' NDCs. Most of the studies take the current submitted NDCs as a starting point to identify linkages with the SDGs and identify linkages based on whether the NDC text explicitly mentions specific keywords related to particular co-benefits or the SDGs. Such studies could then be utilised to maximize the potential co-benefits that arise from such an integrated approach (TERI, 2017; WRI, 2017; New Climate Institute, 2018).

One such similar study by TERI (2017) looked in the SDG footprint of NDCs – how targets of the SDGs treat climate change and how NDC language links to language in the SDG targets. The targets of SDG 7 (Affordable & clean energy), 13 (Climate action), 15 (Life on land) and 17 (Partnerships for the goal) found a high degree match with NDC goals (TERI, 2017).

2.1 India's Domestic Responses to Climate Change – National and Sub-National Actions

National Actions

While India is highly vulnerable to the effects of climate change, owing to its size and recognized as a large developing country, it has not been able to benefit a large from the multilateral/ bilateral processes initiated to support adaptation. This includes processes that were initiated for development of the National Adaptation Programme of Action (NAPAs) and the Pilot Program for Climate Resilience (PPCR) that targeted the Least Developed Countries (LDCs). Hence, India's own effort to introduce any planned action on Adaptation was visible in the year 2008 when India launched its National Action Plan on Climate Change (NAPCC). The NAPCC outlined 8 Missions with a focus on both mitigation and adaptation. The missions on agriculture, water and Sustaining Himalayan Ecosystem have a clear focus on adaptation. The Mission on Green India while encourages sequestration is seen to also draw on co-benefits for adaptation by improving livelihoods. Four more Missions were announced later, however, their stages of development are not very clear. India is obliged to develop the National Adaptation Plan (NAP) as part of its international commitments and is currently in the process of formalizing it.

To detail out the action plan for each of the Missions, nodal Ministries had been identified to lead the Mission and implement it following a consultative process. The National Mission on Sustainable Agriculture (NMSA) is led by the Ministry of Agriculture and aims at promoting sustainable agriculture through the use of technological interventions, social and economic interventions that help improve livelihoods (DAC&FW, 2014). Besides other development programs of the Ministry were also brought into the paradigm of the NMSA. This includes the Rashtriya Krishi Vikas Yojna[1] (RKVY) and the Prime Minister Fasal Bima Yojana (PMFBY[2]). The RKVY was introduced in 2007 with the aim for agricultural development and incentivizes States to escalate public investment in agriculture & its allied sectors. The PMFBY scheme focuses on providing insurance coverage and financial assistance to the

11 Accessed at https://rkvy.nic.in/#

22 Accessed from https://pmfby.gov.in/

farmers in case of failure of any notified crop due to natural calamities, pests and diseases. It also aims at motivating farmers to adopt innovative and modern agricultural practices along with stabilizing their income to safeguard their continuance in farming. The National Water Mission focuses on water conservation, waste minimization and ensuring more equitable distribution of water, both across and within States through integrated water resources development and management. There are 5 goals stated of which one of the goals aims to increase water use efficiency by 20 % (MoWR. 2009). There are many objectives that have been outlined including revision of the Water Policy. State Specific Action Plans (SSAP) on water that can be aligned with the State Action Plan on Climate Change (SAPCC) is being developed (Conference Proceedings). The SSAPs are a step towards monitoring the track of progress in different states and its contribution to the NWM targets. State Specific Action Plans (SSAP) for the water sector in respect of 11 States (Andhra Pradesh, Telangana, West Bengal, Uttarakhand, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu and Arunachal Pradesh) have been taken up in first phase and the remaining states will be taken up subsequently. The Green India Mission focuses on protecting, restoring and enhancing country's decreasing forest cover contributing to mitigation and co-benefits for adaptation. It is likely to affect nearly 3 million households ("Green India Mission", n.d). The National Health Mission (NHM) was launched by the Government of India in 2013 and focuses on rural as well as urban areas. It has introduced the National Rural Health Mission (NRHM) and the National Urban Health Mission (NUHM) ("National Health Mission", n.d). The NRHM focus of the mission is on creating a fully functional, community owned, decentralized health delivery system with inter-sectoral convergence at all levels, to ensure immediate action on a wide range of determinants of health such as water, sanitation, education, nutrition, social and gender equality (National Rural Health Mission", n.d). NUHM focuses on meeting the health care needs of the urban population with the emphasis more on the urban poor, by providing them with essential primary health care services. This will be attained by strengthening the already existing health care service delivery system, along with joining with various schemes relating to wider determinants of health like drinking water, sanitation, school education, etc. that have been implemented by the Ministries (National Urban Health Mission", n.d). National Mission for Sustaining Himalayan Ecosystem (NMSHE) seeks to understand the impacts of climate change on Himalayas and to formulate appropriate policy interventions to sustain and safeguard Himalayan ecosystem ("NMSHE", n.d). The Ministry of Environment, Forest and Climate Change (MOEFCC), Government of India, is currently in the process of drafting the National Coastal Mission[3].

The National Innovations on Climate Resilient Agriculture (NICRA) was launched during February 2011 with the objective to promote strategic research, technology demonstrations and capacity building. To be able to support Adaptation in the country, the government announced the development of the National Adaptation Fund for Climate Change (NAFCC) in 2015 and has identified a National Implementing Entity, National Bank for Agriculture and Rural Development (NABARD), to help execute adaptation on-ground. An amount of 350 crores had been allocated to begin with for the first 2 years of its operation. The overall aim of NAFCC is to support concrete adaptation activities which mitigate the adverse effects of climate change. The projects under NAFCC aim to build climate resilience in the areas identified under the SAPCCs (State Action Plan on Climate Change) and the relevant Missions under the NAPCC (National Action Plan on Climate Change). Besides the above

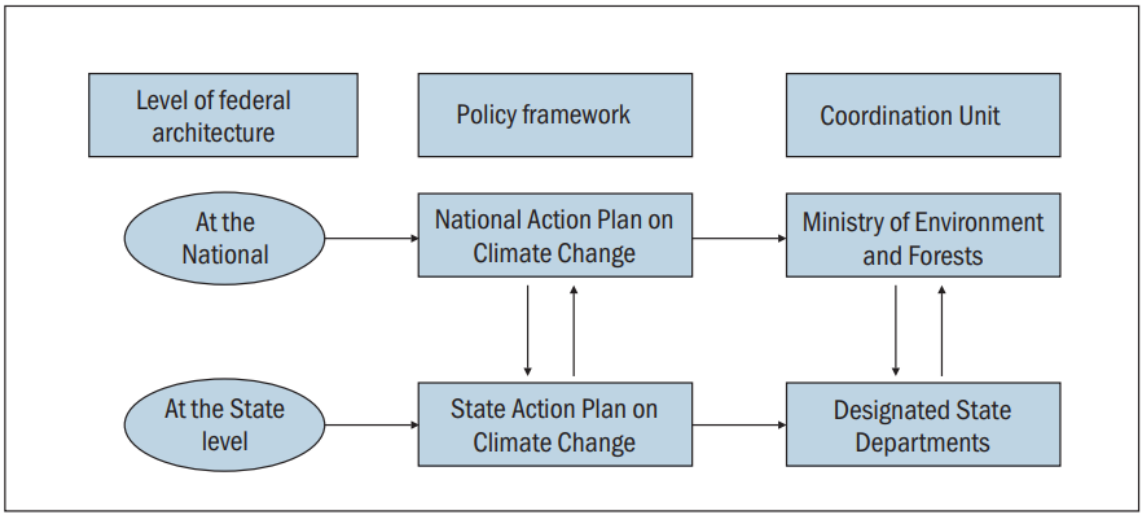
[3] Accessed at http://sicom.nic.in/projects/national-coastal-mission/mission

policies and programs that have been introduced to address climate change concerns there are other developmental schemes and programs that also have the potential to contribute to adaptation in each of the core areas. For instance the Pradhan Mantri Krishi Sinchayee Yojana[4] (PMKSY), the Watershed Management Program etc. are some examples to quote.

Sub-national Actions

At the sub-national scale, about 32 State Action Plans on Climate Change (SAPCC) have been submitted by states and union territories. The SAPCC allows the states to prioritize issues relevant to the State in the context of climate change and indicate areas wherein interventions would be needed. These plans in most cases have been developed based on cues from vulnerability assessments conducted at various levels. The SAPCCs, like the NAPCC, have been framed using sustainable development considerations (Jogesh and Dubash, 2014) in an attempt to make benefits reach the most vulnerable communities. The decentralized nature of climate action is being coordinated by harmonizing actions at the Centre and State level through a common framework (MoEF&CC).

Figure 3: Preparation of action plans on climate change at the national and state level



Source: Mishra et al. (2018)

The central government has now urged the states to revise and prepare a second version of their SAPCC in order to reflect the progress of the first cycle as well as changes in current realities ("Centre urges state", 2018).

Besides there are some bilateral/ multilateral programs that have recently started that support the States to promote adaptation on-ground. This includes the Programme on Climate Resilient Agriculture (PoCRA) initiative being led by the State of Maharashtra initiated in 2018 to be implemented in drought affected regions. So far 23 State driven adaptation projects have been sanctioned under the NAFCC.

[4] Accessed at: https://pmksy.gov.in/Default.aspx

3. Existing Monitoring and Evaluation Frameworks

Adaptation to climate change has been reiterated as a key policy priority lately with the Paris Agreement pushing towards striking a balance between climate change mitigation and adaptation actions. This is also being reflected by countries that are directing huge sums of money towards adaptation efforts while complementarily extracting developmental benefits associated with them. In order to justify this funding and sustain future adaptation finance flows, a clear process for verifying adaptation results is crucial.

A few examples of existing M&E frameworks have been put forth by institutions like IIED (Tracking Adaptation and Measuring Development Framework), GIZ (Results-based Monitoring System) and GEF (The Adaptation Monitoring and Assessment Tool). Their past experiences in developing broad frameworks and tracking tools for adaptation and in evaluating such projects, have aided such organisations to develop their M&E frameworks. All these frameworks make use of indicators that capture different facets of measuring adaptation performance. For instance, all the three use indicators that measure the capacity to capture climate risk and measure reduction in climate vulnerability. While there are institutional frameworks available for measuring adaptation, various countries like France, UK, Norway Germany to name a few, have developed their own institutional processes for measuring adaptation

3.1 Existing Frameworks for Evaluation of Development Projects

A large democracy with hundreds of programs and schemes being implemented, monitoring and evaluation has been core in India since the very beginning. Monitoring and Evaluation of Various Programs and Schemes of the Centre and State has been in process since the 1950s with the Planning Commission playing a key role in administering it with the objective to assist the government in making informed decisions regarding program operations and service delivery, promote efficient use of resources, assess impacts. However the service deliveries of such evaluations have been affected over time given re-alignment of governments and change in objectives. Also limitations lay in understanding how these evaluation reports had been considered and what actions had been taken? In a report published by the World Bank it is highlighted that lack of an evaluation data bank prevents an understanding on how effective these evaluations have been (Mehrotra, 2013). 2007-2012, the XIth Plan period saw developments in the evaluation system in the country. MIS based systems were established for all centrally sponsored schemes. A Development Monitoring Unit was developed in the Prime Minister's office in 2009, with the objective of regular monitoring of the implementation of the flagship programs of the central government. Third, the central government decided to create a Performance Management and Evaluation System, located in the Cabinet Secretariat. Finally, the Planning Commission decided to create a new Independent Evaluation Office (IEO), which began functioning in 2013.

Pressure driving accountability in delivery of work has been through multiple sources including the media, civil society organisations, the comptroller auditor general (CAG) and the judiciary system. Also political interests in ensuring that their flagship programs deliver have created demand for evaluation over time. Besides, multilateral agencies like the World Bank, Asian Development Bank, UN agencies and bilateral donors support evaluation of programs to which they have contributed.

However these evaluations had not considered climate risks as a component until late. There are multiple reasons for it including challenges related to understanding adaptation and its distinction from baseline development. Absence of frameworks and building of capacities in this area within countries has prevented appropriate action in the M&E of adaptation projects thus far.

3.2 Existing Frameworks for Evaluation of Response Measures considering Adaptation

In the Indian context, the existing frameworks for climate change adaptation are largely articulated at a program/project level. One of the examples that stand out in this regard is Watershed Organisation Trust's attempt to track progress of watershed development projects in terms of climate change adaptation objectives (Gray et al., 2016). It used a bottom up M&E approach that served as an input to a learning-based iterative adaptive management process (STAP, 2017). The National Innovations on Climate Resilient Agriculture (NICRA[5]) is another example that includes an M&E system primarily based on the use of indicators that capture the social, economic, environmental and biophysical impacts of the interventions. The impacts are monitored by using a baseline that is established by collecting household level information through surveys for both NICRA and non NICRA villages[6].

In 2018, with the support of the World Bank, the Government of Maharashtra announced a Programme on Climate Resilient Agriculture (PoCRA) for the Marathwada region. Parallell to the announcing of the call the government has appointed monitoring and evaluation experts to understand the progress of work being undertaken. The framework broadly includes collection of baseline data and information, a mid-term review and an end-line assessment to understand the overall achievements of the project. Concurrent monitoring processes have been put in place, two each year, to monitor that processes are being followed to help achieve the overall goals. Indicators have been identified based on components defined and overall goals defined.

In its recent call in 2019, the NITI Aayog has requested for experts to evaluate various programmes and schemes of the Government of India. One of the components clearly identified for review includes performance of the project with regard to environment, climate and sustainability.

Adaptation to climate change certainly is a priority to be considered inherent in the implementation of various policies and programs. While centrally sponsored schemes and programs are slowly including monitoring of progress with regard to climate indicators, it is just a beginning. Other programmes and schemes introduced on a programmatic/ project mode, State projects and other sources may not necessarily have such frameworks for monitoring and evaluation. Billions of Rupees are being spent on Adaptation with the objective of reaching overarching goals of reducing risks related to climate change. Also, given that the government has introduced its own funds targeting adaptation, The National Adaptation Fund on Climate Change (NAFCC), there is a need to systematise a process wherein the progress of work undertaken in monitored and evaluated, learnings of which are then taken into account into any future planning and implementation. Many of these programmes and projects if centrally sponsored are evaluated from an expenditure point of view, however, the progress of the work is left to the line Ministry and local authorities.

4. Sectors and Focus Areas for the ICAT-A India Case Study

State Level Climate Proofing of the Budget, Agriculture, Water and Livelihoods has been clearly identified as priority sectors/ areas for selection as case studies. National consultations

[5] Accessed from http://nicra-icar.in/nicrarevised/index.php/key-features
[6] National Consultations with CRIDA held on 13th March, 2019 at TERI, India.

with experts and government representatives from the Centre and States constituted the basis for identification of sectors and focus areas for the ICAT-A study.

4.1. Sensitivities to Climate Variability and Change and Identification of Sectors/ Focus Areas

Due to India's diverse climatological and agro-geographical conditions, the impacts of climate change tend to vary both at the regional and local scale. For instance, some regions that are ecologically-fragile are likely to experience more losses compared to others for instance mountain areas, coastal, arid and semi-arid areas. Similarly, the socio-economic status of communities essentially determines how vulnerable they are to climate change impacts. In this backdrop, the sub-sectors of priority also tend to differ across states and local areas depending on impacts posed by climate change and the socio-economic classification of the communities inhabiting the area.

India has ambitious programs that are implemented both through centrally sponsored and state sponsored schemes. Besides there are targeted bilateral and multilateral programs being implemented in many of these sectors including agriculture and water. All these programs centre- state-multi/ bilateral ultimately get implemented through the State Machinery in place.

Agriculture plays a vital role in India's economy, with over 40 % of India's population (~520 million) engaged in agricultural activities and contributing to around 17% of the GDP. Even so majority of India's 138 million operational farm holdings are small with about 85 percent of farmers operating on less than 2 hectares keeping them poor and facing increasing vulnerabilities against climate change and economic shocks. Further, the concentration of poverty is higher in landless agricultural labor households and marginal farm households, which account for more than 50 per cent of the total poor in India. Additionally, 84 percent of women depend on agriculture for their livelihoods directly or indirectly and make up 33 per cent of cultivators and 47 per cent of agricultural laborers. The burden of the sector on the economy comes not from the numbers engaged in the work, but from the uncertainty and lack of predictability of assured incomes from this economic activity. Indian agriculture remains dependent on rainfall, in particular South-West monsoons, with 60 percent of the cultivated area growing rainfed crops. On average 12 million hectares of crop area has been affected annually by abnormal monsoons in the last two decades, with shocks to yields and agricultural production.

There is now increasing evidence on the agriculture sector's vulnerability to climate change. Between 2014 - 2018, the level of real agricultural GDP and real agriculture revenues has remained constant, owing in part to weak monsoons in two of those years. Future projections indicate that in many parts of India, farmers will face more challenging conditions, characterized by a warmer environment, more erratic rainfall patterns and more frequent extreme events. Using district level data, India's Economic Survey 2018 documents a long-term trend of rising temperatures, declining average precipitation, and increase in extreme precipitation events. It also states that based on projected long-term weather patterns, climate change could reduce annual agricultural incomes in the range of 15 percent to 18 percent on average and up to 20 percent to 25 percent for unirrigated areas. Studies indicate that the 2017 floods in Northern India led to extensive crop losses and infrastructural damage in states like Bihar, Uttar Pradesh, Assam and, West Bengal. Likewise, South India witnessed a decrease in the amount of rainfall which caused droughts in 2017. As a result, many farmers lost their livelihoods since they were unable to sustain their agricultural land due to water

shortages. The preliminary estimates from the recent Cyclone Fani in 2019 indicate huge damages to standing crops as well as irrigation equipment.

Water is essential for all life-forms. While water for drinking is a priority, most water in the country is utilized for irrigation, approximately 82 % and above. Hence changes in rainfall and its distribution have significant impacts on water availability. Perennial rivers like the Indus, Brahmaputra and Ganga are likely to be affected with flows of waters varying dependent on the glacial melt drawn (Biemans et al., 2018). High intensity rainfall events, reduced recharge and consistent drought conditions in certain areas are clear areas of concern.

4.2. Potential Case Studies for ICAT-A as discussed in the national/ sub-national scale consultations held

The consultations provided some suggestions on possible interventions that could be explored under the ICAT-A phase I initiative.

- **Climate-Proofing of the State Budget:** The state of Telengana expressed interest in developing environment and climate change indicators for certain identified sectors/ programmes being run in the State.
- **Government of India led Programme on National Innovations in Climate Resilient Agriculture (NICRA)** launched 2011, the objective of programme is to reduce the vulnerability of Agriculture in India to climate change with the help of multiple components like strategic research, technology demonstration and dissemination, knowledge management and capacity building.
- **Zero Budget Natural Farming (ZBNF):** It is a program which is being implemented in Andhra Pradesh since 2015, by Ryhtu Sadhikara Samastha, a non-governmental organization. ZBNF aims to replace conventional chemical inputs with natural resources in the farming processes that can address climate change concerns and also increase farmer welfare. The program contemplates to promote natural farming among six million farmers by 2024, covering almost eight million hectares of cultivable land by 2026. With active involvement of marginal farmers, women self-help groups and gram panchayats, the project has successfully made 163,000 farmers across 13 districts of the state to switch to natural farming (Palit et al., 2019). While this may primarily help reduce GHG emissions from land on the other hand, through retaining soil moisture and reducing irrigation requirements in a semi-arid belt does have contributions to adaptation.

- **Mukhyamantri Jal Swavalamban Abhiyan (MJSA):** It is one of the largest initiatives to conserve water in India that was launched in Rajasthan in 2016. To tackle the problem of water scarcity in Rajasthan, MJSA aims to make the villages water self- reliant mainly through interventions like rainwater harvesting and various others like afforestation, catchment area development, surface storage interventions etc. The water conservation strategies have been implemented in more than 3500 villages in the first year followed by 4200 villages each in the second and third year (Conference Proceedings). The results of MJSA have significantly helped the dry state to overcome instances of droughts and water scarcity.
- **Mission Kakatiya:** It is a flagship programme that aims to restore and repair existing about 46,500 water tanks that cater to the agricultural water requirements in the

Telangana ("Mission Kakatiya", n.d). The initiative is expected to improve the rural economy as a whole by reviving the groundwater table, increasing the farm yield and, enhancing the income for small and marginal farmers. As per the Mission Kakatiya Dashboard, the project is presently running in the fourth phase and has surveyed about 27,972 tanks located in 16,793 villages of the state ("Mission Kakatiya Dashboard", n.d).

- **Mission Bhagiratha:** It is a flagship program initiated by the Government of Telangana in 2016. The mission aims to provide access to safe and sustainable piped drinking water to rural areas, municipalities and municipal corporations. It includes sourcing water from rivers/reservoirs followed by its purification in water treatment plants which is then circulated to the households through a piping system. It targets to provide access to safe drinking water to 2.72 crore people from almost 65.29 lac households ("Project Highlights",n.d).

4.3. Limitations and Gaps

Adaptation decision takes cognizance of variables that span socio-economic, financial, climatic, institutional and political in nature. Deep seated uncertainty regarding the aforementioned variables often compound risks associated with an adaptation strategy. These factors are especially pertinent for a country as climatically diverse as India where the need for massive adaptation centric investments across different sectors, is constrained because of limited financial resources.

The process of measuring adaptation is complex owing to the lack of clarity around what measurable impacts of the interventions entail. The absence of holistic metrics/evaluation techniques that understand the impact, add to the complexity. The current sole focus on monitoring adaptation is a challenge, it is therefore pertinent to focus on impact and evaluation methods. There is an overarching need for a shift to practice Monitoring, Evaluation and Learning (MEL) in order to make the process of adaptation decision making more iterative and robust in nature.

Deliberations with key stakeholders have highlighted few key shortcomings within M&E of projects within the adaptation policy space;

- ***Cumbersome process and data intensive:*** Monitoring and Evaluation of performance of projects is normally cumbersome as it requires a separate process to be put in place for the evaluation. A strong program evaluation team that works continuously on assessing effectiveness of projects being delivered. It is a data intensive process that demands a strong institutional set-up to be operating at various scales. This makes it resource intensive with the already limited financial resources available for execution.
- ***Lack of coordination between multi-level stakeholders and the centre and state machineries*:** Despite the fact that SAPCC is a step towards active inclusion of state concerns and priorities within a national framework, policies within the adaptation realm suffer from an overall top-down approach when it comes to financial devolution. Efficient financial devolution from centre to state need requisite institutional mechanisms to be in place (TERI, 2015). This lack of coordination and feedback mechanism hinders effective monitoring and evaluation of existing adaptation policies. Absence of well-functional institutional structures below the state level further encumbers the process of monitoring and evaluation.
- ***Absence of India's National Adaptation Plan***: The absence of a National Adaptation Plan (NAP) for India causes lacunae of national and sub-national focus and consultation

on adaptation centric policies. The formulation of NAP will likely lay down a foundation for inclusive, progressive and an iterative progress on adaptation action (LDC expert group, 2012)

- ***Need for a comprehensive MEL framework***: The nature of existing M&E frameworks do not account for climate risks. The NITI Aayog is making an attempt to integrate these indicators in already existing programs. However these programs lack a baseline and therefore it is not clear what conclusions can be drawn from if new frameworks are developed. Also, most of these programmes have been designed purely as development programs and their contribution to adaptation is not clear.

5. Way Forward

The overarching objective of ICAT is to assist national and state governments with capacity building and methodological support for transparent assessment of implementation of various adaptation policies and programs. The progress of such policies and programs will be tracked through an exhaustive analysis of changes in policy documents, planning/approval processes and of changes in the relevant institutional structures. ICAT is a demand driven process, which once embedded in the government can examine and therein improve the effectiveness of various adaptation policies and also encourage further uptake of the same through national dialogue and training. The following steps are envisaged under the project:

- ***Review of existing MEL frameworks on Adaptation***: MEL frameworks of specific projects, programs or countries might have different objectives, approaches and methodologies but, combining these insights can help in improving future adaptation planning and monitoring. To kick-start the process of designing a robust MEL framework for India, a clear understanding of the existing global, national and sub-national frameworks on adaptation is paramount. This will help us in familiarising the elements that comprise an efficient monitoring system, understand the diverse design approaches taken to operationalize these systems, and eventually help us understand the challenges and opportunities for contextualising such processes for India. The project envisages building on this understanding and will focus on in-depth analysis of the existing systems for MEL across scales and geographies to yield context-driven frameworks for India.
- ***Development of MEL Framework on Adaptation using a Bottom-up Approach:*** As identified above the project will focus on evaluating and developing existing policy. It has largely been agreed upon that the priority sectors for the country are agriculture, water, forest, and energy. So a framework to take cognizance of the adaptation progress for India will need to be locale specific with multiple frameworks catering different sectors. In this context the project seeks to evaluate and arrive at a monitoring framework for certain selected policies and programs with potential adaptation benefits at subnational level.
- ***Inputs to revision of India's NDC:*** With the upcoming revision of India's Nationally Determined Contributions (NDC) in year 2020, it is expected that an increased focus on more adaptation programs, especially pertaining to sectors water and forestry, are likely to be pursued along with greening or climate proofing certain programs at the state level. This project is expected to generate inputs into the revision of NDC's to the extent to which it is a consultative process.
- ***Stakeholder Consultations and Development of a multi-log platform:*** A national level advisory committee is in the process of being established. The committee will comprise of experts spanning the policy, research and practice spectrum. Regular consultations will be conducted with the committee members spanning representatives from policy, research

and practice spectrum. In addition to the formation of the national level advisory committee a multi-log platform will be created for effective stakeholder engagement process. This platform will serve as an interactive portal where multiple stakeholders can debate and discuss existing MEL initiatives, contribute to the development of a tool kit and lobby for its policy uptake.

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