

VOLUME I

COPING WITH CLIMATE CHANGE

**AN ANALYSIS OF INDIA'S
NATIONAL ACTION PLAN ON
CLIMATE CHANGE**



Centre for Science and Environment

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1 Introduction

Climate change is one of the most compelling global challenges. According to a report by the National Aeronautics and Space Administration (NASA), the planet's average surface temperature has risen a little more than one degree Celsius during the last century. Records show that 2017 was the third consecutive year in which global temperatures rose by a degree above levels recorded in the late 19th century. The year 2017 was also the warmest non-El Niño year ever marked by extreme weather events around the globe.¹

According to the Intergovernmental Panel on Climate Change (IPCC), rising temperatures will be accompanied by a change in rainfall patterns and increase in the frequency and intensity of extreme weather events around the world.²

Climate change is likely to increase damages from extreme weather events by \$140 billion in 2003–13.³ The impact of climate change is also likely to worsen water scarcity for the 1.6 billion people around the world already living in water stress. According to the latest *Lancet* report, in 2007–16, 306 disasters were recorded on an average out of which over 90 per cent were associated with weather-related events in the last 20 years. Asia was the most affected.⁴

India, like other developing countries, is suffering the brunt of climate change. According to 2017 German Watch report,⁵ India is ranked as the fourth most vulnerable country. The Economic Survey 2017–18 reveals that on an average annual rainfall in India has declined by about 86 mm in the last three decades. While kharif rainfall has declined on an average by 26 mm, the decline in rabi rainfall has been by 33 mm. There has also been a 12.8 per cent decline in kharif yields and 6.7 per cent in rabi yields due to extreme rainfall shocks.⁶

According to the Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad, climate change in India has about 4–9 per cent impact on agriculture each year, which results in a loss of about 1.5 per cent in the gross domestic product (GDP) annually.⁷ The World Bank reports that by 2030, rice and wheat are likely to see a drop of about 6–10 per cent in yield.⁸

Developing countries have a limited capacity to deal with the impacts of climate change and are hence more vulnerable. For instance, according to the estimates stated in climate action plan or the Nationally Determined Contributions (NDC), India will require a whopping \$2.5 trillion to deal with the impacts of climate change by 2030.⁹

THE PRIME MINISTER'S COUNCIL ON CLIMATE CHANGE

In 2007, IPCC published its fourth assessment report that warned of a dangerous increase in frequency and intensity of extreme weather events, especially in tropical and sub-tropical countries.¹⁰ The IPCC report was accompanied by the Bali Action Plan—an outcome of the global climate meeting in Bali, Indonesia in 2007—urging countries to step up climate action. It mandated developed nations to support climate actions in developing countries.

In response to these developments and the increasing extreme weather events faced domestically, the Indian government in 2007 established the Prime Minister's Council on Climate Change (PMCCC). The Council, in coordination with other government departments, published the National Action Plan on Climate Change (NAPCC) in 2008 (ahead of the hyped Copenhagen Climate Summit 2009), within which eight missions were described. To decentralize the NAPCC, the government issued an order for all states to submit their respective State Action Plans on Climate Change (SAPCC), which have now been prepared for almost all states and Union Territories across India.¹¹

On 5 November 2014, the National Democratic Alliance (NDA) government reconstituted PMCCC with the purpose of coordinating national action for assessment, adaptation and mitigation of climate change. The PMCCC would focus on the following tasks:¹²

- Evolve a coordinated response for issues relating to climate change at the national level
- Provide oversight for formulation of action plans in the area of assessment, adaptation and mitigation of climate change
- Periodically monitor key policy decisions

The first meeting of the reconstituted PMCCC was held on 19 January 2015 in which Prime Minister Narendra Modi called for a paradigm shift in global attitude towards climate from 'carbon credit to green credit'. It was emphasized that global awareness on climate change is an opportunity to improve the quality of life of its citizens. The designated ministries were required to submit the progress of their missions to the Council.¹³

Four new national missions are underway and will be presented before the Council before they are officially launched. These are the Wind Mission, Waste-to-Energy Mission, Coastal Mission and Health Mission.¹⁴

CSE reached out to a group of mission directors, advisors and consultants to assess the implementation status of various missions under the NAPCC.

INDIA'S PLEDGES AT INTERNATIONAL CLIMATE NEGOTIATIONS

Within the overarching framework of the United Nations Framework Convention on Climate Change (UNFCCC), parties negotiated three climate deals—Kyoto Protocol, Cancun Agreements, and the Paris Agreement. While under the Kyoto Protocol, only developed countries committed to quantified emission-reduction targets, both developed and developing countries pledged voluntary climate targets under the Cancun and Paris Agreements.

Cancun Agreements (2010)

Under the Cancun Agreements of 2010, India put forth its target to reduce its GDP's emission intensity by 20–25 per cent below 2005 levels by 2020. Several researches, including the latest UNEP Emission Gap Report 2017, point out that India is well on its way to achieving its target.

Paris Agreement (2015)

Under the Paris Agreement—a global climate deal adopted in December 2015 to address climate change—India stated its proposed commitments to address climate change as part of its NDC, which was submitted for 2015–30.

The quantified pledges were stated as follows:

- Share of non-fossil fuel in the total installed capacity to be 40 per cent by 2030
- Emission intensity of GDP to reduce by 33–35 per cent by 2030 from 2005 levels
- To create additional carbon sink of 2.5–3 billion tonnes of CO₂ through additional forest cover by 2030 in India

2 National Action Plan on Climate Change

The NAPCC describes eight missions that deal with climate change adaptation and mitigation:¹⁵

- 1. National Solar Mission:** Aims to promote the use of solar energy in India by making it competitive with fossil fuels. It will promote activities to encourage research and development to improve efficiency and affordability of solar power and energy storage systems.
- 2. National Mission for Enhanced Energy Efficiency:** Aims to improve energy efficiency of domestic, commercial and industrial sectors in India by creating an enabling policy regime and encouraging innovative business models for improving energy efficiency.
- 3. National Mission for Sustainable Habitat:** Aims at encouraging sustainable urban planning in India with the help of policy, infrastructural and research interventions in sectors such as buildings, waste management, water resources and transportation.
- 4. National Water Mission:** Aims to ensure sustainable water supply by conserving water, minimizing waste and ensuring equitable distribution of water resources throughout India.
- 5. National Mission for Strategic Knowledge on Climate Change:** Aims to create a comprehensive knowledge system that informs and supports climate change action in India with the help of research and communication-based actions.
- 6. National Mission for Sustainable Agriculture:** Aims at improving sustainability, productivity, remuneration and climate resilience of agriculture in India. These goals will be achieved by capacity building, research, infrastructural and institutional interventions in the Indian agricultural sector.
- 7. National Mission for Green India:** Aims to protect, enhance and restore forests and respond to climate change with appropriate adaptation and mitigation activities. It plans to increase green cover and focuses on multiple ecosystem services—especially biodiversity, water, biomass, mangroves, wetlands and critical habitats, with carbon sequestration as a co-benefit.
- 8. National Mission for Sustaining the Himalayan Ecosystem:** Aims to enhance understanding of climate change impacts and adaptations required in the Himalayas. The information obtained from this mission will feed into policy formulation for suitable management practices for the Himalayan ecosystem.

MISSIONS AND THEIR IMPLEMENTATION STATUS

Although the nodal ministries entrusted with the implementation of the missions are still to fully assess likely costs, preliminary estimates by the Planning Commission in its 12th Five-Year Plan (FYP) (2012–2017) indicate that Rs 2,30,000 crore would be needed to fulfil various mission objectives.¹⁶

National Solar Mission

India is endowed with a vast solar energy potential, estimated to be over 750 GW.¹⁷ The National Solar Mission (NSM) was launched in 2010 with the primary aim of achieving grid parity by 2022 and with coal-based thermal power by 2030.¹⁸ The focus is to set up an enabling environment for solar technology penetration in the country both at the centralized and decentralized levels. NSM has drawn special interest from government quarters and is one of the most active missions under the NAPCC.

Under the Ministry of New and Renewable Energy (MNRE), NSM initially planned to adopt a three-phase approach—2011–13 as Phase I, the remaining four years of the 12th FYP as Phase II and the 13th FYP (2017–22) as Phase III. While Phase I focused on capturing the ‘low-hanging’ options in solar thermal, promoting off-grid systems and modest capacity addition in grid-based systems, Phase II intended to achieve aggressive capacity addition. The following targets were envisaged in the mission document.¹⁹

- Enabling policy framework for the deployment of 20,000 MW of solar power by 2022
- Increasing capacity of grid-connected solar-power generation to 1000 MW by 2013, and adding 3000 MW by 2017. With international finance and technology, it was projected that the target could be increased to 10,000 MW.
- Promoting programmes for off-grid applications, and reaching 1000 MW by 2017 and 2000 MW by 2022
- Promoting 2000 MW of off-grid solar applications, including 20 million solar lights by 2022
- Creating favourable conditions for developing solar manufacturing capability in the country
- Supporting research and development and capacity building activities to achieve grid parity by 2022

(see Table 1: Targets under the National Solar Mission)

Table 1: Targets under the National Solar Mission

S. no.	Application segment	Phase-I target (2010–13)	Phase-II target (2013–2017)	Phase-III target (2017–22)
1.	Solar collectors	7 million sq. m	15 million sq. m	20 million sq. m
2.	Off-grid solar applications	200 MW	1000 MW	2000 MW
3.	Utility grid power, including rooftop	1000–2000 MW	4000–10,000 MW	20,000 MW

Source: MNRE, 2017

Table 2: Year-wise target of 100 GW

Category	Year							Total
	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	
Solar rooftop	200	4,800	5,000	6,000	7,000	8,000	9,000	40,000
Large-scale solar power projects	1,800	7,200	10,000	10,000	10,000	9,500	8,500	57,000
Total	2,000	12,000	15,000	16,000	17,000	17,500	17,500	97,000

Source: Appraisal Document, MNRE, July 2017

In its 17 June 2015 meeting, the Cabinet revised the cumulative targets for grid-connected solar-power projects initially envisaged from 20,000 MW by 2021–22 to an ambitious 100,000 MW by 2021–22. The revised target of 100 GW is to be achieved in seven years and comprises 40 GW of grid-connected rooftop projects and 60 GW large and medium land-based solar-power projects. The total investment for commissioning 100 GW of solar power has been estimated at Rs 5 lakh crore²⁰ (see *Table 2: Year-wise target of 100 GW*).

Key schemes and achievements²¹

- The government is promoting solar energy through fiscal and promotional incentives such as capital and interest subsidies, generation-based incentives, viability gap funding (VGF), financing solar rooftop systems as part of home loans, concessional excise and custom duties, preferential tariff for power generation from renewable sources, foreign direct investment (FDI) up to 100 per cent, and a Modified Special Incentive Package Scheme (M-SIPS) of the Ministry of Electronics and Information Technology (MEIT).
- The Ministry of Power has issued the renewable purchase obligation (RPO) trajectory up to 2019 though states have to issue regulatory orders.
- Green energy corridors (GEC) with dedicated transmission system are being created for power from renewable energy projects.
- A World Bank loan financing arrangement of \$100 million is being worked out for creating internal infrastructure of solar parks—a scheme launched in 2014 with a target to set up 25 solar parks—targeting around 20,000 MW of solar installed capacity. The target is revised to set up 50 solar parks with a capacity of 40,000 MW. So far, 36 solar parks in 21 states have been sanctioned with a cumulative capacity of 20,700 MW. In addition, the central government is in the process of arranging with the World Bank, in consultation with the finance ministry, a \$100-million loan assistance for creating internal infrastructure of solar parks.
- Net metering is developed to encourage small-scale renewable energy systems to ensure that customers always have a reliable source of energy even when their renewable generators are not producing any, and to provide substantial benefits to the electric power-generating system.²²
- International solar alliance was approved by the Cabinet in December 2016.
- Solar parks and Ultra Mega Solar Power Projects will be set up by 2019–20 with the central government's financial support of Rs 8,100 crore. The total capacity, when operational, will generate 64 billion units of electricity per year that will lead to an abatement of around 55 million tonnes of CO₂ per year over its life cycle.

- Surya Mitra mobile app, a high-end technology platform to handle thousands of calls simultaneously and efficiently monitor all activities on the app, was launched.
- The World Bank, KfW, Asian Development Bank (ADB) and New Development Bank (NDB) sanctioned \$1,300 million for the State Bank of India (SBI), Punjab National Bank (PNB), Canara Bank and Indian Renewable Energy Development Agency (IREDA) to fund solar rooftops at less than 10 per cent interest.²³

Table 3: Schemes for promotion of solar energy

S. no.	Scheme	Component	Central financial assistance/subsidy
1.	Scheme for development of solar parks and Ultra Mega Solar Power Projects	Grid-interactive solar programme	The ministry provides Central Financial Assistance (CFA) of Rs 25 lakh per solar park for the preparation of a detailed project report (DPR), conducting surveys etc. It also provides a CFA of up to Rs 20 lakh per MW or 30 per cent of project cost, including grid-connectivity cost, whichever is lower
2.	Scheme for development of solar PV power plants on canal banks/canal tops		<ul style="list-style-type: none"> • Rs 3 crore/MW or 30 per cent of the project cost, whichever is lower, for the canal-top SPV projects and Rs 1.5 crore/MW or 30 per cent of the project cost, whichever is lower, for canal-bank SPV projects • With the objective of achieving gainful utilization of areas on top of canals and vacant lands along the canal banks, the government has announced Central Financial Assistance (CFA) of up to Rs 225 crore for 100 MW (50 MW on canal tops and the rest on canal banks) to be disbursed in two slabs: <ul style="list-style-type: none"> ▪ up to 40 per cent on sanctioning of the projects ▪ 60 per cent on successful commissioning of the projects • Service charge on Solar Energy Corporation of India (SECI) at one per cent: Rs 2.25 crore
3.	Scheme for getting over 300 MW of grid-connected solar PV power projects by defence establishments under the Ministry of Defence and paramilitary forces with VGF	Grid-interactive solar programme	<p>Solar project developers will be provided viability gap funding (VGF) based on the bid. Bidders will be selected on the basis of bids for minimum commitment to supply solar power at Rs 5.50 K/Eh ($1 \text{ Eh} = 4.35975 \times 10^{-18}$ joule) for 25 years. However, the upper limits of the VGF are as follows:</p> <ul style="list-style-type: none"> • Category I: Rs 2.5 crore/MW for project capacity up to five MW or 30 per cent of the project cost, whichever is lower • Category II: Rs 2 crore/MW for project capacity greater than five MW up to 25 MW or 30 per cent of the project, whichever is lower • Category III: Rs 1.5 crore/MW for project capacity greater than 25 MW or 30 per cent of the project whichever is lower
4.	Scheme for setting up of 750 MW grid-connected solar PV power projects under Batch 1 of Phase II of the Jawaharlal Nehru National Solar Mission (JNNSM) with VGF support from the National Clean Energy Fund (NCEF)		The selection of the bidders was based on the VGF required for the project in an ascending order up to full capacity. VGF is limited to 30 per cent of the project cost or Rs 2.5 crore/MW, whichever is lower. SECI has signed a PPA with such project developers for purchasing entire power from the project for 25 years at Rs 5.45 per unit (Rs 4.75 per unit for projects availing accelerated depreciation). The first 50 per cent of the VGF shall be released on commissioning of the project and the balance shall be released progressively over the next five years, in five instalments of 10 per cent at the end of each successive year.
5.	Off-grid and decentralized solar applications	Grid-connected rooftop	In general, CFA is 30 per cent of the benchmark and 70 per cent for north-east and special category states for government projects

6.	Programme for provision of solar pumps for irrigation and drinking water	Off-grid	<p>The scheme is implemented through state nodal agencies, NABARD and other government departments. The ministry provides 30 per cent capital subsidy equivalent (Rs/HP) through states under the scheme. The ministry also provides a 40 per cent capital subsidy equivalent (Rs/HP) with mandatory loans through banks. Solar pumps have to be installed as per MNRE specifications</p> <table border="1"> <thead> <tr> <th>S. no.</th> <th>SPV systems</th> <th>Capacity</th> <th>Maximum subsidy (rupees per HP)</th> </tr> </thead> <tbody> <tr> <td>i.</td> <td rowspan="2">1 DC pumps</td> <td>Up to 2 HP</td> <td>57,600</td> </tr> <tr> <td>ii.</td> <td>>2HP to 5 HP</td> <td>54,000</td> </tr> <tr> <td>iii.</td> <td rowspan="2">AC pumps</td> <td>Up to 2 HP</td> <td>50,400</td> </tr> <tr> <td>iv.</td> <td>>2HP to 5 HP</td> <td>43,200</td> </tr> <tr> <td>v.</td> <td colspan="3">For pumps > 5–10 HP, subsidy is fixed at Rs 1,94,00 per pump</td> </tr> </tbody> </table>	S. no.	SPV systems	Capacity	Maximum subsidy (rupees per HP)	i.	1 DC pumps	Up to 2 HP	57,600	ii.	>2HP to 5 HP	54,000	iii.	AC pumps	Up to 2 HP	50,400	iv.	>2HP to 5 HP	43,200	v.	For pumps > 5–10 HP, subsidy is fixed at Rs 1,94,00 per pump		
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7.	Development of solar cities programme		Financial support up to Rs 50 lakh for each city may be provided for preparation of the master plan along with a few DPR (up to Rs 10 lakh), overseeing implementation of solar city cell (up to Rs 10 lakh) and organizing promotional activities (up to Rs 20 lakh).																						

Source: MNRE, 2017

Table 4: Year-wise achievement of grid-connected solar-power projects

S. no	Year	Capacity added (MW)	Cumulative (MW)
1	Up to 2010	--	
2	2010–11	25	36
3	2011–12	994	1,030
4	2012–13	656	1,686
5	2013–14	946	2,632
6	2014–15	1,112	3,744
7	2015–16	3,019	6,763
8	2016–17	5,526	12,289
9	2017–18	2,477	14,766

Source: MNRE, 2017

Table 5: Funds allocation per year under NSM

Year	Funds in Rs crore
2010–11	350
2011–12	652
2012–13	599
2013–14	692
2014–15	1,158
2015–16	3,146
2016–17	2,590
Total	9,187

Source: MNRE, 2017

- Solar tariffs have decreased from Rs 18 per unit—a 2010 figure—to Rs 2.44 per kWh. (see *Table 3: Schemes for promotion of solar energy*).

A capacity of 8,003 MW (combining capacities of years 2016–18) has been added since 2016, taking the cumulative capacity to 14,766 MW till 30 September 2017. This has resulted in India reaching the seventh position globally with respect to installed capacity, surpassing Australia and Spain²⁴ (see *Table 4: Year-wise achievement of grid-connected solar-power projects*). The fund allocation to the NSM is increasing each year (see *Table 5: Funds allocation per year under NSM*).

Evaluation and challenges in National Solar Mission

- **Implementation of solar rooftop:** Implementation of solar rooftop has not picked up pace mainly due to slow implementation by distribution companies (DISCOMS). According to ministry sources, the DISCOMS are loss-making and ill-equipped for large-scale market adoption primarily for two reasons. First, the potential loss of revenue and, in particular, loss of high-paying commercial and industrial consumers and, second, the additional implementation burden of modernizing the grid and inspecting, certifying and billing rooftop systems.

Accessible information about quality, cost and benefits of adopting solar, and clarity about connectivity with the grid and metering can help facilitate widespread use of solar rooftops. While the industry has shown optimism on meeting its solar rooftops targets, ministry sources remain sceptical.

- **Non-compliance of solar RPO by state utilities:** The Ministry of Power has issued guidelines for long-term year-wise growth trajectory for RPO compliance till 2018–19. The State Electricity Regulatory Commission (SERC) is still to set up state-wise targets. So far only four states, Andhra Pradesh, Chhattisgarh, Madhya Pradesh and Rajasthan, have issued draft regulations for aligning their RPO trajectory as per the notifications from the power ministry. This is a prerequisite for achieving 100 GW solar power capacities by 2022. However, power being a concurrent subject, universal enforcement may be difficult. Currently, there is no mechanism to replace RPO.
- **Delays in signing Public Private Agreements (PPA):** Lack of direction from the parent ministry, lengthy internal approval processes, involvement of multiple ministries and their uncoordinated approach delay signing of PPAs and project implementation.
- **Transmission infrastructure and grid instability:** Uninterrupted solar power becomes a huge challenge due to grid instability or unavailability of a transmission line. To address this, the GEC is under implementation with an aim to create evacuation and transmission infrastructure for renewable power.

The NSM document highlights solar lighting systems under the ongoing remote-village electrification programme of MNRE to cover about 10,000 villages and hamlets. According to ministry sources, solar lighting is an effective solution for household electrification, but has failed to prove its cost-effectiveness.

India's solar mission is ambitious, with competitive revised targets set by the ministry. However, the government's zeal to step up renewable capacity has to be matched with its will to address challenges. Grid integration has emerged as the biggest challenge. The

intermittent nature—i.e. interrupted and non-continuous supply—of renewables, including solar, is another challenge. Storage of solar energy is also expensive globally, but efforts to develop technology to bring down the cost are ongoing.

The government's financial support to transmission will help catalyse capacity growth as well as balance the grid. Nevertheless, India's competitive targets project its intention to be a world leader in solar, which can channelize investments in its favour.

National Water Mission

To ensure integrated water resource management, conserve water, minimize wastage and ensure equitable distribution of water within states, the National Water Mission (NWM) was approved by the Cabinet in 2011 with a total allocation of Rs 20,630 crore under the 11th FYP (2007–2012). During the 12th FYP (2012–2017), the allocation was reduced to Rs 15,000 crore. The mission is run by the Ministry of Water Resources, River Development and Ganga Rejuvenation.²⁵

The five identified goals of the mission are:²⁶

- (a) Creating a comprehensive water data base in the public domain and assessing the impact of climate change on water resource
- (b) Promoting citizen and state action for water conservation, augmentation and preservation
- (c) Focusing attention to overexploited areas
- (d) Increasing water-use efficiency by 20 per cent
- (e) Promoting basin-level integrated water resources management

The mission document also aims to formulate river-linking projects. Since water is a state subject, the mission identifies the need for states to prepare their state-specific plans of action. It envisages that the respective State Specific Action Plans (SSAP) would be required to conduct critical assessments of current water policies in the states, formulate water budgets, create comprehensive and integrated water plans for water security, safety and sustainability till 2050.²⁷

Initiatives taken under NWM

- The India-WRIS WebGIS, or 'Generation of database and implementation of web enabled water resources information system in the country', a joint venture of the Central Water Commission (CWC), Ministry of Water Resources, Central government and Indian Space Research Organization (ISRO). It aims at a 'single-window' solution for comprehensive, authoritative and consistent data and information of India's water resources and allied natural resources. The project, originally scheduled to be completed in 2013, was extended till 2017 but is still underway.²⁸
- To help states formulate and implement their SSAP, NWM allocated them Rs 50 lakh —out of which Rs 30 lakh was given to Uttarakhand and Arunachal Pradesh—in three instalments, starting in 2015. As of now, the first instalment, amounting to Rs 20 lakh, has been released. In the consultation workshop held in June 2017, the states were invited to present their plans. The plans however lacked a comprehensive picture and were mostly irrigation-centric. It was subsequently decided to develop a model template to adopt and implement plans. The draft SSAP-water model template is in the final stages of adoption.²⁹

- Baseline studies are being carried out to analyse the current situation of irrigation projects in its initial stage. The reports are still to be put in the public domain.
- An MoU was signed between the North Eastern Regional Institute of Water and Land Management (NERIWALM), Tezpur, Assam, and NWM on 16 February 2016. NERIWALM shall act as the nodal agency to get the SSAP for the water sector.³⁰
- An expert committee submitted its report on restructuring the CWC and the Central Ground Water Board (CGWB) in July 2016. It recommended that CWC should be restructured and unified to reconstitute a new NWC, which will help in the collective management of groundwater and surface water and will be responsible for water policy, data and governance in the country.³¹
- Guidelines for human development, capacity building, sensitization and mass awareness programmes were formed in 2016.³²
- Scoping study for ‘national water use efficiency improvement support programme’ was conducted with the support of ADB.
- Operational research to support mainstreaming of integrated flood management under climate change is ongoing. The research uses river basins in Bihar and Orissa as case studies.³³

Key activities and achievements³⁴

- 702 new Hydrological Observation Station (HOS) established till 2016–17 against the target of 800 in 2012–17. This is meant to provide information through 275 flood forecasting sites and help in climate change studies and glacial lake bursts/cloudbursts.
- Establishing 6,376 new groundwater monitoring wells against the target of 9,360.
- Around 668 training sessions were conducted where 56,768 stakeholders were trained till March 2017. Training and capacity building programmes were conducted on mission objectives, efficient use of water and water conservation for different stakeholders, including state officials, water users association, Panchayati Raj Institutions (PRI).
- A total of 1,237 waterbodies were restored till March 2017 as against an ambitious target of 10,000. Around Rs 264.67 crore was released for this.
- Establishment of 24 new and additional forecast stations against the target of 100.
- Till March 2017, 21 baseline studies in irrigation sector were in progress to understand how to increase water efficiency by 20 per cent, mandated in the mission target.
- Work on the SSAP has only begun for the water sector. The initial target was to complete the plan in all 29 states and seven UTs
- A total of 36 additional water quality monitoring stations have been installed against the target of 113.

New developments nationally

- To formulate a national law on water, the draft National Water Framework Bill was proposed in 2016. It envisaged that a national law on water would provide an overarching legal framework with principles for protection, conservation, regulation and management of water. It provides an umbrella framework of the general principles governing the exercise of legislative and executive powers.³⁵
- The Model Groundwater (Sustainable Management) Act, 2016 recognizes groundwater as a local resource and recommends the role of local institutions having primary rights and duties over the resource.³⁶
- In an attempt to have a national consensus on basic concepts and issues relating to water, the National Water Policy was revised and adopted in 2012. The policy, however, does not have a legal standing.

Evaluation

According to government sources, the demand for water by affluent people is increasing and has caused a decline in the per capita availability of water. However, the present water policy does not cater to the fundamentals. Therefore, even though availability and access to water are major concerns, equity issues related to water are also important. Water issues thus not only involve technological elements but address social problems such as ensuring equitable sharing.

Currently, the NWM stands alone in the arena. With two national flagship programmes—Smart Cities and Atal Mission for Rejuvenation and Urban Transformation (AMRUT)—India aims to improve water and sanitation across cities. The programmes aim to make 109 Smart Cities and 500 AMRUT cities get access to clean water and better sanitation. It is thus important that the NWM be aligned with these programmes. The mission must also be revisited in the light of legislative changes that have happened in the recent past.

The Bill is a welcome step for a national overarching law on water and its understanding. It even serves as a broad guideline for states and local governments. Water being a state subject, the onus lies on states to develop their own water-related legislations. The state laws and frameworks must also address and take into account equity issues with regard to water. In the current narrative surrounding water issues, it is treated more as a commodity wherein the discussions on equity and rights are given little or no importance.

Effective implementation of the NWM requires revisiting from the grassroots level to the top. The exact relation of centre vis-à-vis states and villages must be determined. The Centre's facilitative role in empowering states, districts and villages to carry out necessary reforms and legislations cannot be ignored. While the existence of a national mission could inject fresh optimism into the governance of water at the central level, at present decentralized administrative structures are lacking.

National Mission for Green India

The National Mission for Green India, or the Green India Mission (GIM), was adopted in 2014 and is thus one of the newest missions.³⁷ With Rs 46,000 crore allotted as the overall budget, GIM aims at both increasing the forest and tree cover as well as improving the quality of the existing forest cover. The scheme, proposed for a period of 10 years, has the following objectives:

- To increase forest cover to the extent of 5 million hectares (mha) and improve the quality of forest cover on another 5 mha of forest and non-forestlands. This includes:
 - (a) Qualitative improvement of forest cover and/or ecosystem in moderately dense forests (1.5 mha), open degraded forests (3 mha), degraded grassland (0.4 mha) and wetlands (0.1 mha)
 - (b) Eco-restoration and afforestation of scrub, shifting cultivation areas, cold deserts, mangroves, ravines and abandoned mining areas (1.8 mha)
 - (c) Bringing urban/peri-urban lands under forest and tree cover (0.20 mha)
 - (d) Agro-forestry/social forestry (3 mha)
- To enhance ecosystem services such as carbon sequestration and storage (in forests and other ecosystems), hydrological services and biodiversity, along with provisioning services like fuel, fodder, timber and non-timber forest produces (NTFPs)
- To increase forest-based livelihood incomes of about 3 million households

The 12th FYP (2012–17) aims to increase forest and tree cover on 2.5 mha, improve quality of forest cover on another 2.5 mha, improve ecosystems services, increase forest-based livelihood income and enhance annual CO₂ sequestration.³⁸

GIM is being implemented by the Ministry of Environment, Forest and Climate Change (MoEF&CC) within a separate cell. The mission seeks to bring primacy to gram sabha as an overarching institution to oversee mission implementation at the village level. The committees set up by the gram sabha, including the revamped Joint Forest Management Committee (JFMC), Community Forest Management (CFM) groups, van panchayats, committees set up under Forest Rights Act, Biodiversity Management Committees etc., will be strengthened as the primary institutions on the ground for nested decentralized forest governance in rural areas.

The gram sabha also has a key role to carry out the social audit of the mission activities at the village level. Additionally, the mission supports the use of modern technology, such as remote sensing with GPS mapping of plot boundaries, for monitoring at the input and output level.

GIM seeks to converge with the other complementary national missions, programmes and schemes. In that respect, this mission has issued convergence guidelines with the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and the Compensatory Afforestation Fund Management and Planning Authority (CAMPA). Guidelines of convergence with other programmes are also planned for coordination.³⁹

Year-wise allocation of funds under GIM

GIM was made operational in 2015–16 after approval in November 2014 (see *Table 6: Budget allocation for Green India Mission*).

Details of activities and their outcomes

- In the preparatory phase of GIM, funds to the tune of Rs 62.60 crore were released in FY 2011–12 and 2013–14 to 27 states/UTs for undertaking preparatory activities, including institutional strengthening, training, identification of landscapes and preparation of perspective plans at the state level for implementation of the Mission.

Table 6: Budget allocation for Green India Mission

Year	Budget Allocation	Expenditure (in crores)
2015–16	72.00	70.22
2016–17	42.01	41.39
2017–18*	47.80	32.35
Total	161.81	143.96

*Up to 24 October 2017

Source: MoEF, 2017

- The GIM implementation guidelines were finalized in November 2014.
- Convergence guidelines of GIM with MGNREGA and CAMPA were issued in March and May 2015.
- The first regional workshop on GIM was held in Imphal from 25–26 June 2015 to address the selection of landscapes to implement GIM, monitor and evaluate mechanisms using GIS and convergence approach to be adopted with complementary schemes and programmes
- Fund release to states in FY 2015–16 was Rs 70.09 crore as first instalment to seven states—Karnataka, Chhattisgarh, Punjab, Odisha, Manipur, Uttarakhand and Kerala.
- In FY 2016–17, Rs 41.25 crore was released as first instalment to six states—Karnataka, Chhattisgarh, Odisha, Manipur, Andhra Pradesh and Mizoram
- Rs 32.35 crore was released to three states—Mizoram, Chhattisgarh and Odisha in FY 2017–18
- The Central government has launched a novel scheme, known as the Nagar Vana Udyan Yojana, of creating urban forestry, wherein a minimum of 25 ha of forests will be created in the city.
- To address the problem of decreasing forest cover and compensate for forests lost for development purposes, the Compensatory Afforestation Bill was passed in the Parliament in 2016.
- GIM division intends to take up the World Bank-aided 'Ecosystem services improvement project' (ESIP) in selected landscapes of Chhattisgarh and Madhya Pradesh. The project has been designed to enhance the outcomes of the GIM. It proposes to improve forest quality and productivity, along with interventions aimed at reforestation, reducing land degradation, institutional capacity building, enhancing NTFP trade and improving the livelihoods of forest-dependent communities in the central Indian highlands.⁴⁰
- Perspective plans and annual plan of operations (APOs) as envisaged by the mission have been submitted by very few states, including Mizoram, Manipur, Jharkhand and Kerala, which have received approval.

Evaluation of the Mission

This is the third financial year for the GIM since its approval in 2014. It has proved to be one of the most slow-moving missions in the NAPCC as even in its third year it seems to be running in its initial phase. At present, the ministry is hugely understaffed and short of experts with respect to the GIM.

Though the mission envisages an active gram sabha as the primary body at the decentralized level, no initiative has taken place with respect to capacity building at the ground level. Decentralized and participatory governance as envisaged in the mission document seems to be more in principle than reality. As it stands presently, the mission looks more like a plantation scheme. Approaches on carbon sequestration and the issue of forest diversion are largely neglected in the mission.

National Mission for Sustaining the Himalayan Ecosystem

The Cabinet approved the National Mission for Sustaining the Himalayan Ecosystem on 28 February 2014. The Planning Commission suggested that a provision of Rs 900 crore be made during the 12th FYP (2012–17). The only site-specific mission under NAPCC, the National Mission for Sustaining the Himalayan Ecosystem (NMSHE) is run by the Department of Science and Technology (DST) and is aimed at evolving conservation measures for sustaining and safeguarding the Himalayan glaciers and mountains through establishment of a monitoring network, promotion of a community-based management, human resource development and strengthening regional cooperation.⁴¹

Initiatives undertaken under NMSHE

- Mapping all institutions and civil society organizations (CSOs) working in the field of Himalayan ecosystems both within and outside the Himalayas. This exercise revealed that there are as many as 100 institutions and several hundred CSOs working in this area. An inventory of these institutions has been prepared.
- Six thematic task forces have been finalized. These are
 - a) Natural and Geographical Wealth by the Wadia Institute of Himalayan Geology
 - b) Forest Resources and Plant Biodiversity by GB Pant Institute on Himalayan Environment and Development, Almora
 - c) Micro Flora and Fauna, Wildlife and Animal Population by Wildlife Institute of India, Dehradun
 - d) Traditional Knowledge Systems by JNU
 - e) Water, Ice, Snow and Glaciers by National Institute of Hydrology, Roorkee
 - f) Himalayan Agriculture by Indian Council of Agricultural Research (ICAR)
- State climate-change centres have been set up in the seven Himalayan states, namely, Jammu and Kashmir, Himachal Pradesh, Manipur, Mizoram, Tripura, Sikkim and Meghalaya.
- A capacity-building programme titled 'Indo-Swiss Capacity Building Programme on Himalayan Glaciology' was launched by DST in collaboration with the Swiss Agency of Development and Cooperation (SDC), with the main mandate to build capacity in the field of glaciology and related areas in climate change.⁴²
- Under the Indo-Swiss bilateral cooperation, a capacity-building programme on

adaptation planning and implementation comprising two orientations and three trainings has been developed in consultation with the Himachal Pradesh government.

- A common framework for integrated 'vulnerability, risks and hazard assessment' has also been developed for implementation in the entire Himalayan region and is to be used as a guidance tool for other Himalayan states.

Evaluation

NMSHE at present confronts financial and technical constraints. Skilled expert manpower is also a challenge. Moreover, the mission objectives require coordination among research and scientific institutions and the ministries, which has emerged as a major challenge. In this process of coordination, objectives are also distributed among stakeholders, leading to dealing of issues with different approaches and delays in implementation.

National Mission on Strategic Knowledge for Climate Change

The National Mission on Strategic Knowledge for Climate Change (NMSKCC) came into existence in 2010, with the aim of building a knowledge platform and infrastructure, sharing information and data to set the climate change agenda, building excellence through collaborative synergies and activities, making viable investment in all existing knowledge capacities of partners and building new capacities for filling gaps.

NMSKCC targets the creation of 10 thematic knowledge networks, publication of 10 technical reports (with annual frequency), creation of regional climate models, 50 chair professorships, 200 specially trained climate change research professionals, public-private partnerships, collaborations with other countries, outreach and public awareness. The mission also envisages significant role of states in their active participation.⁴³ NMSKCC reach has been slow in the last few years.

Key initiatives under NMSKCC

- An important initiative, the Global Technology Watch Group (GTWG) has been set up which aims to keep track of state-of-the-art technologies emerging globally in eight sectors—coal, renewable energy, agriculture, water, sustainable habitat, manufacturing, energy efficiency and forestry. The mission aims to make the suitable technology commercially available by 2030. So far, the focus has been on renewable energy, especially solar, where the focus is on photo-voltaic technologies, solar-thermal technologies, storage for energy management and business models and policy.
- GTWB for six sectors—agriculture, water, sustainable habitat, manufacturing, energy efficiency and forestry—have been recently set up under the DST Technology Information Forecasting and Assessment Council (TIFAC). With the initial process of data collection on its way, GTWB is expected to submit its first report within a year.
- Centres for Excellence have been launched at IIT Bombay (Centre for Excellence on Climate Change) and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Hyderabad (Centre for Plant Research).
- Major research and development projects were launched, including Ocean Acidification and Sea-level Rise under the National Institute of Oceanology (NIO); Regional Climate Modelling and Storm Surges under IIT-Delhi; Extreme Rainfall Studies under the University of Allahabad; and Adaptation in Himachal Pradesh under IRADE.

- Existing centres of excellence in IIT Chennai (Indo-German Centre for Sustainability) and IISc Bangalore (Divecha Centre for Climate Change).
- National Network on Climate Change Impact on Human Health and National Network on Climate Modelling launched.
- Proposed new programmes: State climate-change cells in all states; institutional and human capacity-building nodal agency to be set up in states.

Evaluation

The formation of GTWGs is an overarching highlight of the initiative. But the initiative in itself is one of the slowest-moving missions and is currently reeling under a financial and expertise crunch. Also, even though states are recognized as significant drivers of the mission, no significant development is seen on this front. States are still to establish nodal agencies to carry forward the work on the mission. Most of the work on capacity-building initiatives, setting up of climate networks, establishments of data-sharing systems and enhancing research and development activities at the state level is still to be seen. Additionally, inter-ministerial coordination has emerged as one of the main challenges in implementation of the mission.

National Mission on Enhanced Energy Efficiency

The National Mission for Enhanced Energy Efficiency (NMEEE) was approved by the Cabinet in June 2010. Estimated to run at a cost of Rs 74,000 crore, the mission is based on the Electricity Act, 2001 and falls under the Bureau of Energy Efficiency (BEE). It aims to provide energy efficiency and meet the energy demands of the country. It also intends to achieve total avoided capacity addition of 19,598 MW, fuel savings of around 23 million tonnes per year and greenhouse gas emissions reductions of 98.55 million tonnes per year at its full implementation stage.⁴⁴

NMEEE comprises four initiatives—Perform, Achieve and Trade (PAT), Market Transformation for Energy Efficiency (MTEE), Energy Efficiency Financing Platform (EEFP) and Framework for Energy Efficient Economic Development (FEEED).⁴⁵

Key initiative: PAT

Perform, Achieve and Trade (PAT) was launched in 2012. It is the most notable initiative under the NMEEE. During the first cycle of PAT (from 2012–15), eight energy intensive sectors—thermal power plants, iron and steel, cement, fertilizer, aluminium, textile, pulp and paper, chlor-alkali—have been included. There are about 478 designated consumers in these eight sectors, accounting for about 165 million tonnes of oil equivalent of energy consumption annually. The cumulative target for energy saving for Cycle I was 6.68 million tonnes of oil equivalent (MTOE) to be achieved by the end of 2014–15, against which energy saving of 8.67 MTOE have been achieved—about 30 per cent more than the target.⁴⁶ It resulted in 5,635 MW of energy saving, which is 1.25 per cent of India's total primary energy supply. This has resulted in emission reduction of 31 million tonnes of CO₂, equalling 1.93 per cent of India's total emissions.

In PAT Cycle II (2016–19), 621 industries from 11 sectors were given specific energy consumption (SEC) targets, with energy saving of 8.869 MTOE by the assessment year 2018–19. PAT Cycle II was initiated from 1 April 2016 and the achievement of the cycle will be assessed in 2019–20.

Under PAT, capacity building of over 5000 engineers and operators was conducted and 13,718 energy auditors and managers trained. Additionally, an investment of Rs 25,000 crore went into developing energy efficient technologies.

In September 2017, BEE organized training workshops on financing energy efficiency for financial institutions. In the next eight months, 17 workshops in different cities across India will be conducted.⁴⁷ Energy Efficiency Services Ltd (EESL) were created as a corporate entity to provide market leadership.⁴⁸

A number of other initiatives have also commenced, including distribution of energy-efficient appliances, where the government has distributed about 23.39 crore LED lights under the Pradhan Mantri Ujjwala Yojana to provide free clean cooking gas connections to women below the poverty line. More than 2.8 crore LPG connections have been released.⁴⁹

Evaluation

Financing energy efficiency projects is a global challenge. Sources point to the requirement of dedicated lending institutions. For instance, IREDA serves as a dedicated lending institution for renewable energy certificates. Similar institutions are required for energy efficiency. Further, a secured payment mechanism to host financial institutions where energy efficiency projects are implemented is absent. Financial efficiency projects are therefore considered risky by financial institutions. As in other missions, skilled manpower and technical expertise remains a challenge here too.

Despite the challenges, sources in BEE recognize NMEEE as one of the functioning missions with limited budgetary support and place high confidence on PAT as the core constituent of the mission. Currently, PAT is being adopted by the industry at a fast pace. Other schemes and programmes are meant to support and provide an atmosphere useful for its proper functioning. PAT II has a target of 60 million tonnes carbon abatement. Talks are on to include the building sector in PAT IV and the sugar industry by PAT V.

While the ministry and industry sources have responded positively to NMEEE—which is largely due to the success of PAT—the government keeps a contrary view. Niti Aayog's energy plan highlights major hurdles in the fulfilment of the goals of the Mission, which is its poor inter-sectoral linkages. It is true that energy efficiency programmes require close coordination between energy-supplying and -consuming sectors, as well as with technology development, management apparatus and finance streams, which is currently lacking in the Mission.

Energy efficiency is pushed from two sides—investment and technology. Therefore, even if investment is pushed hard and provided for, technical shift remains a major problem. The Central government's document also recommends putting effective instruments in place in order to enhance energy efficiency such as tradable-energy-saving certificates, innovative financing mechanisms that capture future energy savings, and introduction of fiscal instruments.⁵⁰ Therefore, much needs to be done for the mission on the whole for it to be a success.

National Mission on Sustainable Habitat

The National Mission on Sustainable Habitat (NMSH), approved in 2010 with an outlay of Rs 54,200 crore, aimed at integrating mitigation and adaptation into the urban planning process with a view to make cities sustainable through improvements in energy efficiency of buildings, management of solid waste and shift to public transport.⁵¹ The Mission however

does not contain specific targets. Rs 950 crore was allocated for the mission in the 12th FYP (2012–17). Currently, the institutions are undergoing reforms as the Ministry of Housing and Urban Poverty Alleviation and the Ministry of Urban Affairs have been clubbed with the Ministry of Housing and Urban Affairs, which would now serve as the nodal agency for the Sustainable Habitat Mission.

Technical divisions such as the CPWD, CPHEEO, Town and Country Planning Organisation (TCPO) and the Institute of Urban Transport (IUT) are key links to the NMSH's sector-wise agenda. Key deliverables of the mission include:

- a) Development of sustainable habitat standards that lead to robust development strategies while simultaneously addressing climate change-related concerns
- b) Preparation of city development plans that comprehensively address adaptation and mitigation concerns
- c) Preparation of comprehensive mobility plans that enable cities to undertake long-term, energy-efficient and cost-effective transport planning
- d) Capacity building for undertaking activities relevant to the mission

As of now, development of sustainable habitat standards has picked up pace and the MoUD has constituted six sub-committees mandated with the task of identifying standards in six areas, i.e. energy efficiency in the residential and commercial building sectors,⁵² urban transport,⁵³ water supply and sewerage,⁵⁴ urban planning, urban storm-water drainage and municipal waste,⁵⁵ for which the subcommittees have come out with their standards.

The Planning Commission envisaged that many of the activities expected under NMSH would be taken under JNNURM-II or AMRUT to ensure convergence.⁵⁶ AMRUT was launched in June 2015, with a total outlay of Rs 50,000 crore for five years from FY 2015–16 to FY 2019–20 and operated as a centrally sponsored scheme.⁵⁷ The thrust areas of AMRUT—i.e. water supply, sewerage facilities and septage management, storm-water drains to reduce flooding, pedestrian, non-motorized and public transport facilities, parking spaces, creating and upgrading green spaces, parks and recreation centres in cities—align closely with that of the Mission.⁵⁸

Key initiatives

- The National Advisory Committee (NAC) under the chairmanship of its secretary has been constituted to provide strategic direction for guidance and planning for effective implementation of the mission.⁵⁹
- In 2014, Central Public Works Department (CPWD) came out with a document on 'guidelines on sustainable habitat standards'. The key element of the document is to attempt and formulate sustainability index for building materials.⁶⁰

Green buildings and energy efficiency: Incorporation of green building norms as part of the CPWD Works Manual 2012.⁶¹

- Draft model building by-laws was released in March 2016. This is an advisory document for state governments and UTs to enable them to make necessary provisions in their respective building by-laws.⁶²
- Amendments have been made to Pradhan Mantri Awas Yojna in September 2017 with regard to beneficiaries and carpet area.

- Government launched the Energy Conservation Building Code (ECBC) in June 2017 for new commercial buildings to be constructed across India. The code is estimated to achieve a 50 per cent reduction in energy use by 2030.⁶³ The code first came out in 2007 and was revised in 2017. However, it needs to be applied to all buildings including private residential structures with high energy use.
- National Building Code (NBC) 2016 is a national instrument providing guidelines for regulating building construction activities across the country. It is widely used by state/local bodies regulating development and construction activities. The code was revised in 2016 and reflects on state-of-the-art and contemporary international practices.
- BEE has also developed design guidelines for energy-efficient multi-storey residential buildings for composite and hot-dry climates.⁶⁴
- BEE has introduced a scheme for implementing energy efficiency in existing Central government buildings through the ESCO mode. This programme rates buildings on a one to five-star scale, with five-star-labelled buildings being the most energy efficient. So far, around 184 buildings have been star rated under various categories.⁶⁵

Urban transport: Norms in road transport are of utmost significance since the road sector accounts for 90 per cent of the emissions from transport sector. The sub-committee has also proposed the creation of a dedicated urban transport fund (UTF) to make transport investments sustainable and use levies on private vehicles to subsidize public transport and non-motorized transport.

- National Urban Transport Policy (NUTP) was introduced in 2014 with the prime objective of making urban transportation an important parameter at the planning stage, bringing about a more equitable allocation of road space with people.⁶⁶ It has also proposed to increase excise at the national level and the registration cost (city level) of diesel-propelled private vehicles. It suggests formation of transport management associations to facilitate implementation of sustainable transport initiatives.
- Corporate Average Fuel Consumption (CAFC) regulations were notified in 2015 with the aim to improve the fuel efficiency of automobiles in the wake of the rising costs of oil. CSE analysis further showed that rules have allowed number of concessions for the car industry to score extra points for certain technologies for compliance with the norm, which can effectively weaken the programme.^{67, 68}

Water and solid waste management: The government proposed a revised version of rules on solid waste management 16 years after they were first implemented. The revised rules extend to urban and industrial areas, advocate waste segregation at source, and segregation into wet (biodegradable), dry and domestic hazardous wastes. Additionally, it also talks about integration of waste pickers into the formal system.⁶⁹

- In 2014, the Central government launched the Swachh Bharat Abhiyaan towards achieving a 'clean and open-defecation-free India' by 2019, focusing on the areas of sanitation and solid waste management. Under this mission—which comes under the Ministry of Drinking Water and Sanitation—the government plans to build 1.52 million toilets in rural areas along river Ganga and 1.45 million toilets (private and public) in cities⁷⁰ adjoining the river banks.

- Envisaging all Indian cities and towns to be sanitized, the government has come out with the National Policy on Faecal Sludge and Septage Management (NPFMS) in February 2017.⁷¹
- A total of 197,142 individual toilets in households were built till March 2017 against the target of 127,105.
- Draft National Water Framework Bill came out in 2016 to provide uniform national legal framework to manage water supply, river rejuvenation, integrated river basin management, and storm-water drainage.⁷²
- CPHEEO in April 2014 came out with an advisory on water supply and sanitation.⁷³
- The Central Public Health and Environmental Engineering Organization (CPHEEO) manual on sewerage and sewage treatment gives recommendations on quality norms for use of treated sewage for specified activities. A committee has been formed under the chairmanship of the Ministry of Urban Development (MoUD) to come up with standards for Smart City projects with the Bureau of Indian Standards (BIS).

Evaluation

The NMSH is highly advisory in nature. The scope and coverage of the mission is very broad but it lacks specificities. It is important to note that the previous scheme known as the Jawaharlal Nehru National Urban Renewable Mission (JNNURM) was identified as the main channel for implementation and routing of funds for NMSH. However, since 2015 new initiatives including AMRUT, Smart City initiative, HRIDAY, Swachh Bharat and National Urban Livelihoods Mission etc. have been launched to concentrate on core areas as their objectives overlap with NMSH. Such schemes are more sectoral and the coverage is vast. Moreover, they present the view that cities are the main vehicle for driving change.

For instance, AMRUT, which covers 500 cities, focuses on access to water, water management and storm water while the focus of Swachh Bharat is on sanitation, public hygiene and community participation. The government's position is that the fundamentals of NMSH reflect in the new schemes. But taking into account specific sectoral and wide scope of the new schemes, they have been able to draw wider attention and momentum, while the NMSH seems to have lost its value.

According to ministry sources, synchronization among different ministries and convergence of NMSH with aligned missions and schemes appears to be the key issues bringing delay in city development plans for implementation of sustainable habitat guidelines. The guidelines that have been prepared for sustainable habitat, transport and energy efficiency have to be incorporated into the urban planning process, which is still to assume shape.

National Mission on Sustainable Agriculture

The National Mission of Sustainable Agriculture was launched in 2013 with special emphasis on soil and water conservation, water use efficiency, soil health management and rain-fed area development. The Mission requires a budgetary support of Rs 1,08,000 crore (approximately \$17.4 billion) up to the end of the 12th FYP (2012–17).⁷⁴ During the 12th FYP, these dimensions have been embedded and mainstreamed into missions/programmes/schemes of the agriculture ministry including NMSA through a process of restructuring of

various schemes/missions implemented during the 11th FYP along with convergence with other Central/state government programmes.⁷⁵

The key components of the mission are as follows:

- **Rain-fed Area Development (RAD):** RAD is the most important component of the Mission. This element intends to adopt an area-based approach for development and conservation of natural resources along with farming systems. This component has been formulated in a watershed plus framework. The purpose is to introduce appropriate farming systems to integrate components of agriculture with income-generating activities and value addition.
- **On-Farm Water Management (OFWM)** will focus primarily on enhancing water use efficiency by promoting efficient on-farm water management technologies and equipment, primarily like drip and sprinkler technologies, efficient water application and distribution system, secondary storage and drainage development.
- **Soil Health Management (SHM):** The sole priority of this management system is on residue management, organic farming practices by ways of creating and linking soil fertility maps with macro-micro nutrient management, appropriate land use based on land capability, and judicious application of fertilizers and minimizing the soil erosion/degradation.
- **Climate Change and Sustainable Agriculture Monitoring, Modelling and Networking (CCSAMMN):** CCSAMMN will provide creation and bidirectional (land/farmers to research/scientific establishments and vice versa) dissemination of climate change related information and knowledge

All these components require integration with ongoing aligned programmes, including MGNREGA, Integrated Watershed Management Programme (IWMP), Accelerated Irrigation Benefit Programme (AIBP), Rashtriya Krishi Vikas Yojana (RKVY), National Food Security Mission (NFSM), Mission for Integrated Development for Horticulture (MIDH), National Mission on Agricultural Extension and Technology (NMAET), National Livestock Mission, and Mission for Integrated Development of Horticulture (MIDH) etc.

As per the National Mission for Sustainable Agriculture, all states would form a 'mission implementation plan' in coordination with the district and state agriculture plans. A specific Annual Action Plan (AAP) will implement mission implementation plan by formulating specific physical and financial targets and implementation mechanism under each component. States are required to send their detailed 'annual progress report' to Department of Agriculture and Cooperation (DAC).

Key institutions

The mission envisages that state departments of agriculture will have the overall responsibility for implementing NMSA in a mission mode at the state level. Panchayati raj institutions (PRIs) should be actively involved in planning and implementation of NMSA.

At the state level, the process of implementation will be monitored by the State Standing Technical Committee (SSTC) and the State Mission on Sustainable Agriculture (SMSA) or State Level Committee (SLC). At the national level, NMSA will be monitored by the Project Sanctioning Committee (PSC) and Standing Technical Committee (STC). Web-based

monitoring, video conferencing, desk reviews, field visits and evaluation of programme implementation will be followed for effective monitoring of mission initiatives.

National Advisory Committee (NAC), under the chairmanship of its secretary, has been constituted to provide strategic direction for guidance and planning for effective implementation of the mission. At the state level, SLC chaired by Agriculture Production Commissioner (APC)/principal with representation from concerned line departments such as revenue, animal husbandry, fisheries, forests etc., will oversee planning and implementation of the mission.⁷⁶

Aligned activities

- Programmes such as System of Rice Intensification (SRI) against conventional rice cultivation and coverage of milch animals under the ration balancing programme for addressing mitigation and adaptation.
- The National Initiative on Climate Resilient Agriculture was also launched in 2011 to address both adaptation and mitigation in the agriculture sector.
- Numerous initiatives have been launched, including the Soil Health Card. Neem-coated urea is being promoted to regulate use of the crystalline compound. Parampragat Krishi Vikas Yojana (PKVY) is being implemented to promote organic farming in the country. Pradhan Mantri Krishi Sinchai Yojana (PMKSY) is being implemented to expand cultivated area.
- The National Food Security Act, 2013 promulgated by the government is aimed at ensuring, inter alia, timely and efficient procurement and distribution of food grains, building and maintenance of food stocks, and their efficient storage, movement and delivery to consumers.
- The Global Environment Facility (GEF) has approved Rs 250 crore for the project related to Ministry of Agriculture and Farmers Welfare on the subject 'to obtain revolutionary change on the strategies and methodologies for sustainable agriculture in India' to implement it in various parts of the five states—Uttarakhand, Madhya Pradesh, Rajasthan, Orissa and Mizoram.
- Pradhan Mantri Fasal Bima Yojna (PMFBY) came out in 2016 with the primary objective of providing insurance coverage and financial support to farmers in the event of failure of any of the notified crop as a result of natural calamities, pests and diseases.⁷⁷
- In the present Budget, the coverage of PMFBY will be increased from 30 per cent of cropped area in 2016–17 to 40 per cent in 2017–18 and 50 per cent in 2018–19. For 2017–18, the scheme will provide a sum of Rs 9,000 crore. Total allocation for the rural, agricultural and allied sectors in 2017–18 amounts to Rs 1,87,223 crore; Rs 20,000 crore to the corpus of the long-term irrigation fund and Rs 100 crore to the adaptation fund.
- Monitoring Information Systems for implementation of RAD component of NMSA is created. MIS is a web-based monitoring devise for applications.⁷⁸
- The National Sub-Mission on Forestry has also been launched under NMSA.⁷⁹

Table 7: Achievement of funds under the Rainfed Area Development (RAD) Programme under NMSA

Financial year	Rainfed Area Development (in Rs)	Achievement of funds (in Rs)
2014–15	3,04,00,00,000	56,72,76,310
2015–16	1,98,11,35,000	11,00,41,987
2016–17	2,00,20,00,000	6,67,86,235
2017–18	2,16,45,96,671	4,76,21,807

Source: NMSA, 2017 website: <http://nmsa.dac.gov.in/RptAllocationReleaseProgress.aspx>

GLOBAL DEVELOPMENTS

Aligned closely with the objectives of increasing adaptive capacity and reducing vulnerability, the UN General Assembly adopted the resolution 'Transforming our world: the 2030 Agenda for Sustainable Development.' Under the resolution, the Assembly adopted 17 sustainable development goals (SDG) and 169 targets to be achieved by 2030, in an attempt to balance the three dimensions of sustainable development: the economic, social and environmental. Although, the list of SDGs is broad and exhaustive, it includes elements overlapping with the broad objectives of climate goals and NAPCC. Some of these include clean and affordable energy, sustainable cities and communities, climate action, industry innovation and infrastructure etc.⁸⁰

Likewise, the UN General Assembly has also endorsed the Sendai Framework for Disaster Risk Reduction 2015–2030 to prevent new and reduce existing disaster risks and outlines for priority action area. These which are: (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and; (iv) Enhancing disaster preparedness for effective response. The framework is a 15-year non-binding voluntary agreement which basically aims to build resilience of communities and adopt a better approach to reduce risk.⁸¹ India, a signatory to both the frameworks, seeks to implement the objectives within its domestic plans and institutional settings.

Under NMSA, currently only RAD is given prominence. Other components include soil health management, agro-forestry, organic value-chain development and Paramparagat Krishi Vikas Yojna. Out of all the components, the actual achievement of funds is only in RAD component in the last four financial years (see *Table 7: Achievement of funds under the Rainfed Area Development Programme under NSM*).

Evaluation

At present NMSA is designed extensively for large- and medium-sized farms and land holdings. Even though promotion of soil conservation practices, use of biotechnology and improved seed varieties are important components to help all farmer types. There needs to be a more dedicated approach towards climate change resilience of small and marginal farmers.

The mission focuses on sustainable agriculture but fails to recognize the importance of adaptation. No dedicated funds are allotted to adaptation and coping mechanisms with respect to agriculture.

There is a requirement for a more decentralized planning with respect to agriculture. Currently, states lack the guidelines and capabilities to come up with timelines, financial targets and implementation strategies for components under the mission.

Agriculture is an extremely cross-cutting sector, involving water, sanitation, rural development and environment ministries. The success of NSM depends on the extent to which it can be integrated with several national-level programmes with respect to agriculture, food security, and development, including the National Mission on Agriculture Expansion and Technology, National Food Security Mission, Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Farm Management Mission—which is a broad objective. Such programmes fall under different ministries and departments, and coordination is the biggest challenge.

3 Conclusion and the way ahead

The genesis of NAPCC was domestic and global climate developments that necessitated a holistic national programme to respond to climate change. Formed ahead of the crucial Copenhagen Summit, it served as a tool to showcase India's seriousness in tackling climate change. A vast amount of bureaucratic machinery was exhausted in creating missions and launching them formally after NAPCC's initiation in 2008. Even though NAPCC has been in existence for close to a decade, research shows that for most missions it has only been three to four years since they came into effect. It is also clear that progress has been almost uncertain for most of the missions.

Currently, the approach to climate change as seen in the NAPCC is too broad and lacks specificities. While the solar, energy efficiency, and forestry missions include mitigation components in the form of quantified targets, missions on sustainable agriculture, water, and sustainable Himalayas are purely adaptive.

The National Solar Mission has been most active and ministry sources show high confidence in it although there is recognition that the targets set are too ambitious. High confidence is also seen in NMEEE owing to the success of PAT, a central component of the mission. Niti Aayog recommends the creation of an Energy Conservation Fund to ease efficiency-improving technology interventions. These missions—NSM and NMEEE—also have clear and quantified targets and have been able to draw investments. For some missions, such as GIM, quantified targets do exist but their long-term nature, lack of clarity in objectives, financial constraints, shortage of a skilled workforce and technical expertise have proved to be major barriers in implementing the objectives. In the case of the National Mission on Strategic Knowledge for Climate Change, it is unlikely that it would attract most of its funding by itself unless the development of green technology and research is mainstreamed into the central plans of scientific departments and research institutes.

Missions dealing with subjects as sustainable habitat, water, and agriculture and forestry are multi-sectoral, overlapping and multi-departmental in nature. They are advisory and holistic and have been slow moving. Several ongoing activities are in principle aligned with the objectives of the sustainable habitat and agriculture missions, but there has been no official announcement of their integration with the missions. For instance, the AMRUT mission has elements that are similar to those of the NMSH; the major difference is AMRUT's approach which is more sectoral in nature.

Should such missions be scrapped in the light of new schemes and programmes with similar objectives, or should they be converged with new policies and legislative developments to maintain functionality? The missions' accomplishments have to be done at the ground level, which requires functional and efficient decentralized structures and institutions at the state, district and village levels. States and sub-state structures also require methodological guidance to prepare action plans along with the creating implementing structures and agencies, as well as monetary and technological support.

Another challenge for the missions is their monitoring systems, which are either ineffective or absent. Progress reports for NSM, NMEEE, and NWM are currently available in the public domain but mapping of progress for other missions has been difficult due to their cross-cutting nature.

Ministries are also required to report progress and have regular meetings with the PM's Council on Climate Change but the Council itself has met only once since its reconstitution. Apart from putting out the mission's progress in quantitative and qualitative terms, progress reports should highlight the impact they have had on the ground in terms of supporting communities and making them more climate-resilient. Unfortunately, no such approach has been adopted.

In the final analysis, it can be said that institutional, systemic and process barriers—including financial constraints, inter-ministerial coordination, lack of technical expertise and project clearance delays—stand as major challenges in the efficient implementation of the missions. The most obvious source of financing for climate change action is currently the limited government budgetary support. Also, while solar and energy efficiency missions are considered successful, the mission-mode approach for dealing with cross-cutting subjects has not worked. A new approach needs to be devised to mainstream the climate agenda in the cross-cutting sectors.

NAPCC, almost 10 years old and formulated with lofty objectives, has not served as the best answer for India to cope with climate impacts. The 12th Five-Year Plan document has questioned the effectiveness of the missions and pressed for the need to revamp missions. While this challenges the status quo and has drawn criticism from a few missions' quarters, it also provides us another opportunity for renewed discussion on the current approaches to deal with climate change in India and understand the best way ahead to mainstream climate change.

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Climate change is one of the most compelling global challenges, with a warming planet being a present-day reality rather than a potential future threat. India, like other developing countries, is also suffering the brunt of climate change.

According to the Intergovernmental Panel on Climate Change (IPCC), rising temperatures will be accompanied by a change in rainfall patterns and increase in the frequency and intensity of extreme weather events around the world.

In response to global and domestic climate developments, the Indian government established the Prime Minister's Council on Climate Change (PMCCC), which proposed the National Action Plan on Climate Change (NAPCC) in 2008 that described eight missions aimed at dealing with climate change adaptation and mitigation.

This report aims at evaluation and assessment of the missions and their implementation status.



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