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MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE

PERFORMANCE OF THE NATIONAL ACTION PLAN ON CLIMATE CHANGE (NAPCC)

COMMITTEE ON ESTIMATES
(2018-2019)

THIRTIETH REPORT

(SIXTEENTH LOK SABHA)

LOK SABHA SECRETARIAT
NEW DELHI

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Presented to Lok Sabha on 13 December, 2018

LOK SABHA SECRETARIAT
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*Elected *vide* Lok Sabha Bulletin Part-II No. 3908 dated 28.07.2016 vice Shri Arjun Ram Meghwal appointed as Minister.

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*** Elected vide Lok Sabha Bulletin Part – II No. 6141 dated 22.12.2017 vice Shri Ashwini Kumar Choubey appointed as Minister**

$ Elected vide Lok Sabha Bulletin Part – II No. 6141 dated 22.12.2017 vice Shri Sultan Ahmed died

& Elected vide Lok Sabha Bulletin Part – II No. 6141 dated 22.12.2017 vice Shri Gajendra Singh Shekhawat appointed as Minister

% Elected vide Lok Sabha Bulletin Part – II No. 6141 dated 22.12.2017 vice Shri Nanabhau Falgunrao Patole resigned

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3.	Shri Vipin Kumar	-	Director
4.	Shri Sujay Kumar	-	Under Secretary
5.	Shri L. Shantikumar Singh	-	Committee Assistant

INTRODUCTION

I, the Chairperson of the Committee on Estimates, having been authorized by the Committee to submit the Report on their behalf, do present this Thirtieth Report on the subject 'Performance of the National Action Plan on Climate Change (NAPCC)'.

2. Climate Change poses a major threat to the world today. It has far-reaching implications for environment, agriculture, water availability, natural resources, ecosystem, biodiversity, economy and social well-being. As per the series of assessment reports of the United Nations Inter-Governmental Panel on Climate Change (IPCC), human influence on the climate system is clear, and recent anthropogenic emissions of green house gases (GHG) are the highest in history. The IPCC report has underlined that the impacts and costs of 1.5ºC of global warming could be reached in as little as 11 years and almost certainly in 20 years if there are no major cuts in CO_2 emissions. The impact of such warming will be felt across ecosystems, communities and economies. Climate change will reduce agricultural yield, apart from other harmful consequences. Climate change is projected to increase soil erosion, affect water availability and quality. There is a need to adopt an integrated and well co-ordinated strategy to address climate change issues for the very survival of our planet. In the Indian context, it becomes all the more important and challenging in view of country's dependence on climate sensitive sectors such as agriculture and forestry.

3. In the aforesaid backdrop, the Committee on Estimates (2016-17) selected the subject 'Performance of the National Action Plan on Climate Change (NAPCC)' for in-depth examination and report to the House. The Committee on Estimates (2017-18) and (2018-19) continued with the examination of the subject.

4. In this report, the Committee have dealt with various issues like need for integrated approach and coordination amongst various Ministries/stakeholders handling eight Missions; necessity of launching new missions; implementation of State Action Plans and their functioning; sufficiency and effective utilization of financial allocation; various programmes and schemes; mitigation activities undertaken and achievements and outcomes/outputs of each of the eight Missions. The Committee have analysed these issues/points in detail and have made observations/recommendations in the report.

5. The Committee held sittings on 28.02.2017, 01.03.2017, 12.05.2017, 11.07.2017 (two sittings), 12.07.2017 (two sittings) and 26.09.2017 (two sittings) to take oral evidence of domain experts and the representatives of the Ministries of Environment, Forest & Climate Change, New and Renewable Energy, Power, Water Resources, River Development & Ganga Rejuvenation, Housing and Urban Affairs, Agriculture and Farmers Welfare (Department of Agriculture, Cooperation & Farmers Welfare), Science & Technology (Department of Science & Technology), Earth Sciences and Urban Development. The Committee considered and adopted the report at their sitting held on 11.10.2018.

6. The Committee place on record their sincere thanks to various domain experts, Dr. Vandana Shiva, Dr. Ravi Chellam, Dr. Sunita Narain, and Shri Devinder Sharma who appeared before the Committee and furnished their considered views on the subject. The Committee also wish to express their thanks to the representatives of the aforementioned Ministries, who appeared before them and placed their considered views on the subject and furnished the information required in connection with the examination of the subject.

7. For facility of reference and convenience, the observations/recommendations of the Committee have been printed in bold in Part-II of the Report.

NEW DELHI;
10 December, 2018
19 Agrahayana, 1940 (Saka)

Dr. MURLI MANOHAR JOSHI,
CHAIRPERSON,
COMMITTEE ON ESTIMATES.

ACRONYMS

AMRUT	Atal Mission on Rejuvenation and Urban Transformation
AWS	automatic weather stations
BCM	billion cubic metre
BE	Budget Estimate
BEE	Bureau of Energy Efficiency
BLY	Bachat Lamp Yojana
BPL	Below Poverty Line
BRTS	Bus Rapid Transit Systems
CC	Climate Change
CCEs	crop-cutting experiments
CCP	Climate Change Programme
CFL	compact fluorescent lamp
CH_4	Methane
CHG- WIHG	Centre for Himalayan Glaciology, Wadia Institute of Himalayan Geology
CO	Carbon monoxide
CO_2	Carbon dioxide
COP21	The Conference of Parties at Paris
CPCB	Central Pollution Control Board
CT/PT	community and public toilets
CWPRS	Central Water and Power Research Station
CWRDM	Centre for Water Resources Development and Management
DAC&FW	Department of Agriculture, Cooperation & Farmers Welfare
DAHD&F	Department of Animal Husbandry, Dairying & Fisheries
DARE	Department of Agricultural Research and Education
DISCOMs	Distribution Companies
DSR	Direct Seeded Rice
DSSAT	Decision Support System for Agrotechnology Transfer
DST	Department of Science and Technology
EC Act	Electricity Act
EEFP	Energy Efficiency Financing Platform
EESL	Energy Efficiency Services Limited
ESCerts	Energy Saving Certificates
FEEED	Framework for Energy Efficient Economic Development
FICCI	Federation of Indian Chambers of Commerce and Industry
FSSM	Faecal Sludge and Septage Management
FY	Financial Year
GBNIHESD	GB Pant National Institute of Himalayan Environment and Sustainable Development

GDP	Gross Domestic Product
GEC	Green Climate Fund
GHG	greenhouse gas
GIM	Green India Mission
GIS	Geographic Information System
GOI	Government of India
GTWG	Global Technology Watch Group
GST	Goods and Services Tax
GW	Gigawatt
HIRMI	Haryana Irrigation Research and Management Institute
HYVs	high yielding varieties
ICAR	Indian Council of Agricultural Research
ICAR-IIWM	ICAR-Indian Institute of Water Management
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IGP	Indo-Gangetic plains
IGNP	Indira Gandhi Nahar Project
IHHL	individual house hold latrine
IHR	Indian Himalayan Region
IIT	Indian Institute of Technology
IMD	India Meteorological Department
IMG	Inter-Ministerial Group
India NPIM	India National Participatory Irrigation Management
IISER	Indian Institutes of Science Education and Research
IPCC	Intergovernmental Panel on Climate Change
IRADe	Integrated Research and Action for Development
IREDA	Indian Renewable Development Agency Ltd
IUCCCC	Inter-University Consortium on Cryosphere and Climate Change
JNNSM	Jawaharlal Nehru National Solar Mission
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
kW	kilowatt
kWh	Kilowatt-hour
LED	light-emitting diode
MIS	Micro Irrigation System
MNIT, Jaipur	Malaviya National Institute of Technology, Jaipur
MNRE	Ministry of New and Renewable Energy
MoEF&CC	Ministry of Environment, Forest & Climate Change
MoHUA	Ministry of Housing and Urban Affairs
MoP	Ministry of Power
MoWR,RD&GR	Ministry of Water Resources, River Development & Ganga Rejuvenation
MSW	municipal solid waste

mtoe	million tonne of oil equivalent
MW	Megawatt
MWp	Megawatt peak
N_2O	Nitrous oxide
NAFCC	National Adaptation Fund for Climate Change
NAPCC	National Action Plan on Climate Change
NBRI	National Botanical Research Institute
NCEF	National Clean Energy Find
NCEEF	National Clean Energy and Environment Fund
NDCs	Nationally Determined Contributions
NERIWALM	North Eastern Regional Institute of Water and Land Management
NFSM	National Food Security Mission
NGT	National Green Tribunal
NH_3	Ammonia
NICRA	National Innovation for Climate Resilient Agriculture
NIE	National Implementing Entity
NIF	National Innovation Foundation
NIH	National Institute of Hydrology
NIO, Goa	National Institute of Oceanography, Goa
NIRD	National Institute of Rural Development and Panchayati Raj
NMEEE	National Mission for Enhanced Energy Efficiency
NMHC	Non-methane hydrocarbons
NMSA	National Mission on Sustainable Habitat
NMSHE	National Mission for Sustaining the Himalayan Ecosystem
NMSKCC	National Mission on Strategic Knowledge for Climate Change
NMVOC	Non-methane volatile organic compounds
NPOP	National Programme for Organic Production
MTEE	Market Transformation for Energy Efficiency
MTPA	million tonnes per annum
NMSA	National Mission for Sustainable Agriculture
NOx	Nitrogen oxides
NSM	National Solar Mission
NWM	National Water Mission
ODF	open defecation free
PAT	Perform, Achieve, Trade
PGS	Participatory Guarantee System
PKVY	Paramparagat Krishi Vikas Yojana
PoA	programme of action
PMCCC	Prime Minister's Council on Climate Change
PMFBY	Pradhan Mantri Fasal Bima Yojana

PRGFEE	Partial Risk Guarantee Fund for Energy Efficiency
PSUs	Public Sector Undertakings
RE	Revised Estimate
REC	Rural Electrification Corporation Limited
RECPDCL	REC Power Distribution Company Limited
SAAP	State Annual Action Plan
SAPCC	State Action Plan on Climate Change
SBM-U	Swachh Bharat Mission-Urban
SEC	specific energy consumption
SHC	Soil Health Card
SHM	Soil Health Management
SOx	Sulphur oxides
SPV	solar photovoltaic
SRI	System of Rice Intensification
ST	solar thermal
SVNIT, Surat	Sardar Vallabhbhai National Institute of Technology, Surat
TERI	The Energy and Resources Institute
TISS	Tata Institute of Social Sciences
TKS	Traditional Knowledge System
UNFCCC	United Nations Framework Convention on Climate Change
VCFEE	Venture Capital Fund for Energy Efficiency
VGF	Viability Gap Funding
WALAMTARI	Water and Land Management Training And Research Institute
WALMI	Water and Land Management Institute
WII	Wildlife Institute of India
ZBNF	Zero Budget Natural Farming

Part - I

CHAPTER - I

INTRODUCTORY

According to the Intergovernmental Panel on Climate Change (IPCC), climate change refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), where climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods. Climate change poses a major threat to the world today in view of its far-reaching implications for environment, agriculture, water availability, natural resources, ecosystem, biodiversity, economy and social well-being.

1.2 In 1975, the "global warming" was first inserted into the public domain which can be taken as the starting point for discussion on climate change. In 1988, the Intergovernmental Panel on Climate Change (IPCC) was formed to collate and assess evidence on climate change. The IPCC brought out its first Assessment Report in 1990 which concluded that temperatures have risen by 0.3-0.6ºC over the last century, that humanity's emissions are adding to the atmosphere's natural complement of greenhouse gases, and that the addition would be expected to result in warming. The Earth Summit was held in 1992 at Rio de Janeiro where the assessment of United Nations Framework Convention on Climate Change (UNFCCC) was agreed to. Its key objective is "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". Developed countries agreed to return their emissions to 1990 levels. Since then, there has been a number of international conventions which confirmed the phenomenon of climate change and the urgency of intervention to save the planet. The Conference of Parties (COP21) at Paris was held in 2015 where all participating countries came together to fight the menace. However, the commitments made here were not binding.

1.3 The awareness about the need for protecting and managing environment has been underlined in our religious scriptures which are thousands of years old. There are *shlokas* in our *puranas* and *vedas* and other religious texts which equates the natural environment with divinity and expounds on the virtue of co-existing with the nature. India, however, is especially vulnerable to the effects of climate change today. Our agriculture is still dependent on vagaries of weather and rainfall and we have a large population living in coastal areas and mountain areas which are under immediate threat as a result of climate change. In line of rising temperature across the globe, all India mean temperature has risen nearly around 0.60ºC over the last 110 years. As per information supplied by the Ministry of Agriculture and Farmers' Welfare, the climate change is projected to reduce irrigated rice yield by ~4% in 2020 and rain-fed rice yield by 6% in the 2020 and <2.5% in 2050. Similarly, wheat yield will be reduced by 6 to 23% by 2050, and maize yield will be decreased by 18%, if no adaptation is followed. The climate change may also affect the quality of food grains in terms of reduced concentration of grain protein and some minerals like zinc and iron due to elevated Carbon Dioxide (CO_2). Besides, global warming is likely to lead to a loss of 1.6Mt milk production by 2020 and 15Mt by 2050 if no adaptation is followed. Climate change is projected to increase soil erosion, affect water availability and quality. In order to address the growing threat caused by the climate change, the Government has launched the National Action Plan on Climate Change (NAPCC) in June 2008 to achieve its goals and to deal with the issues related to climate change.

1.4 In the aforesaid backdrop, the Committee decided to undertake comprehensive examination of the various aspects related to performance of the National Action Plan on Climate Change.

National Action Plan on Climate Change (NAPCC) – Analysis of allocations and expenditure

1.5 NAPCC comprises the following eight missions:

1. National Solar Mission
2. National Mission on Enhanced Energy Efficiency
3. National Water Mission
4. National Mission for a Green India

5. National Mission on Sustainable Habitat
6. National Mission for Sustainable Agriculture
7. National Mission for Sustaining the Himalayan Ecosystem
8. National Mission on Strategic Knowledge for Climate Change

1.6 While the report is being finalised, a 9th element has also been under consideration for a mission-based approach. Elaborating further, a representative of the Ministry of Earth Sciences, during oral deposition before the Committee, stated as under:

> "With regard to the coastal line of India, we have prepared jointly with the Ministry of Environment, a National Coastal Mission. It addresses all the issues relating to the coastal zone, particularly with respect to sea level rise. This proposal has been submitted to the Cabinet Secretariat for approval It is now in the advanced stage of approval. Once it gets approved, we will take care of all the mangrove research areas, coral and inundation of sea water into fresh water. In Mumbai, the problem is because of heavy rainfall plus high tide. But as you rightly said, if we increase the mangrove potential along the coastal line, it will also protect the coastal areas and the coastal population. That is why, this National Coastal Mission has been prepared and it is in the advanced stage of approval."

1.7 Each mission is anchored under a Ministry, which is responsible for its implementation and lays down the budget provisions and actionable priorities for it. Ministry of Environment, Forest and Climate Change (MoEF&CC) is the coordinating Ministry of NAPCC.

1.8 Thirty two States and Union Territories (UTs) have also prepared State Action Plan on Climate Change (SAPCC) consistent with the objectives of NAPCC. Five missions, i.e., Sustainable Habitat, Water, Sustaining Himalayan Ecosystems, Sustainable Agriculture and Strategic Knowledge for Climate Change are adaptation missions which aim to address the adverse impact of climate change in the specific sectors. With respect to the severe weather events, India Meteorological Department (IMD) has setup a network of State Meteorological Centres for early warning and better coordination. IMD simultaneously shares its forecast and warning with respective national/state/district level disaster management authorities. Government has established the National Adaptation Fund for Climate Change (NAFCC) with the objective to assist State and Union Territories that are particularly vulnerable to the

adverse effects of climate change in meeting the cost of adaptation. The National Bank for Agriculture and Rural Development (NABARD) has been appointed as National Implementing Entity (NIE) responsible for implementation of adaptation projects under the NAFCC. The focus of the fund is to assist adaptation projects and programmes to support concrete adaptation activities that reduce the effects of climate change facing communities and sectors.

1.9 India also plans to implement the Nationally Determined Contributions (NDCs), submitted to the UNFCCC under the Paris Agreement, during the period 2021-2030. The three quantitative goals of the NDCs are: (i) reduce greenhouse gas (GHG) emissions intensity of its Gross Domestic Product (GDP) by 33 to 35 percent by 2030 from 2005 level; (ii) achieve about 40 percent 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); and (iii) create an additional carbon sink of 2.5 to 3 billion tonnes of CO_2eq. through additional forest and tree cover by 2030.

1.10 With regard to creation of missions under the NAPCC, an expert informed the Committee as under:

> "...My feedback to the Government when it was being framed and my feedback to this hon. Committee is that it is a very fragmented mission, and climate change is not a fragmented problem and the solutions to climate change have to be systemic solutions or holistic solutions. They cannot be compartmentalised. Not only it is fragmented, but it is extremely biased towards finding commercial solutions and forgetting people's contributions. It is also very oriented to finding engineering solutions which are not full solutions and ignoring the ecological solutions to an ecological problem.
>
> The other very, very severe lacunae in the climate mission is that it is not addressing the new threats, besides the fact of climate change, like the new strategic threats coming with monopolies on the technologies - monopolies through intellectual property rights - and these are precisely the area where Parliament has very, very major role.
>
> I am going to focus on three things, i.e., our experience and studies on climate impact, our analysis of where the particular mission is inadequate and where strategic orientation could lead us in a very vulnerable position, not just vulnerable to climate change but vulnerable, politically and economically. Because you are the highest institution for this sovereign democratic republic of ours, and sovereignty and democracy of the republic are usually threatened by

some decisions ignoring other aspect. Some actions have taken place in other fields that impact the climate missions."

1.11 On the same issue, another expert stated in oral deposition before the Committee as under:

"नेशनल क्लाइमेट एक्शन प्लॉन है वह कहीं खो गया है। दो प्रोबल्म है क्योंकि क्लाइमेज एक्शन प्लॉन अलग-अलग मिनिस्ट्री का प्लॉन है और अलग-अलग स्कीम का प्लॉन है। सरकार में कोई एक तरीका नहीं है कि हम यह पता कर सकें कि किस स्कीम के अंदर क्या हो रहा है। जो भी मंत्रालय आता है वह कहता है कि हमें एक क्लाइमेट एक्शन के लिए एक अलग डिपार्टमेंट चाहिए हमें उसके लिए लोग चाहिए। हम लोग मानते हैं कि क्लाइमेट एक्शन प्रोग्राम है वह इंडिया का डेवलपमेंट प्रोग्राम है और गवर्नमेंट की जो करेंट स्कीम है वह क्लाइमेट की स्कीम है, उसके लिए एक सेपरेट लिस्टिंग होनी चाहिए। Which scheme has an impact on climate change. उसकी ट्रैकिंग होनी चाहिए।"

1.12 Asked about the schemes/projects eligible for financing under NCEF, MoEF&CC stated as under:

"An Inter-Ministerial Group (IMG) chaired by Finance Secretary approves the projects/schemes eligible for financing under the NCEF. These projects include innovative schemes like Green Energy Corridor for boosting up the transmission sector, Namami Gange, Green India Mission, Jawaharlal Nehru National Solar Mission (JNNSM)'s installation of solar photovoltaic (SPV) lights and small capacity lights, installation of SPV water pumping systems, SPV Power Plants, Grid Connected Rooftop SPV Power Plants, pilot project to assess wind power potential etc. Till date IMG has recommended 55 projects with total Viability Gap Funding (VGF) of ₹34811.19 crore spread over years.

The NCEF grant in the budget during last 4 years are as under:

FY (₹ in Crores)	**Budget grant without NCEF**	**NCEF grant in Budget**	**Total grant in Budget**
2014-15	515.18	1977.35	2492.53
2015-16	226.02	3,989.83	4,215.85
2016-17 (RE)	88.13	4,272.00	4,360.13
2017-18(BE)	131.14	5,341.70	5,472.84 "

1.13 Further, following information about NCEF was given by MoE&FCC in a power-point presentation:

"National Clean Energy Fund (NCEF) was created through Finance bill 2010-11 for financing and promoting clean energy initiatives & funding research in clean energy."

1.14 Subsequently, in the Union budget 2016-17, the coal cess has been renamed as "Clean Environment Cess and the name of NCEF has been changed to National Clean Energy and Environment Fund (NCEEF). However, under the provisions of the Goods and Services Tax (Compensation to States) Act, 2017 which has been notified on 12.04.2017, the coal cess, along with some other cess on pan masala, tobacco, aerated water etc. would constitute GST Compensation Fund and the same would be utilized to compensate the States for five years to compensate them for potential losses on account of GST implementation. After five years any amount left would be shared on 50% basis between Centre and States.

1.15 Details of the amount transferred to NCEF and financed from NCEF for projects given as under:

(₹ in Crore)

Year	Coal Cess Collected	Amount Transferred to NCEF	Amounts financed from NCEF for projects
2010-11	1,066.46	0.00	0.00
2011-12	2,579.55	1,066.46	220.75
2012-13	3,053.19	1,500.00	246.43
2013-14	3,471.98	1,650.00	1,218.78
2014-15	5,393.46	4,700.00	2,087.99
2015-16	12,675.60	5,123.09	5,234.80
2016-17 (RE)	28,500.00	6,902.74	6,902.74
2017-18 (BE)	29,700.00	8,703.00	-
Total	**86,440.21**	**29,645.29**	**15,911.49**

National Adaptation Fund for Climate Change

1.16 National Adaptation Fund for Climate Change (NAFCC) was created by the government in July 2015 at a total cost of ₹350 crore for 2015-16 and 2016-17, to help build resilience and adaptive capacity of communities and sectors, mainstream climate change adaptation into state plans.

1.17 As per press release issued by MoEF&CC, NAFCC is a Central Sector Scheme which was set up in the year 2015-16. The overall aim of NAFCC is to support concrete adaptation activities which mitigate the adverse effects of climate change. The activities under this scheme are implemented in a project mode. The projects related to adaptation in sectors such as agriculture, animal husbandry, water, forestry, tourism, etc. are eligible for funding under NAFCC. National Bank for Agriculture and Rural Development (NABARD) is the National Implementing Entity (NIE).

1.18 The States/UTs are required to prepare the project proposal in consultation with NIE i.e. NABARD. The project proposals are required to be approved by the State Steering Committee on Climate Change to be eligible for consideration under NAFCC. It is the discretion of the State Government to engage any organization to assist in project preparation, as per their requirement.

1.19 The eight missions of NAPCC are being discussed in detail in the subsequent Chapters.

CHAPTER - II

NATIONAL SOLAR MISSION

2.1 Jawaharlal Nehru National Solar Mission or the National Solar Mission (NSM) was launched on 11th January, 2010 with the objective of increasing the share of solar energy in the total energy mix through development of new solar technologies, while attempting to expand the scope of other renewable and non-fossil options such as nuclear energy, wind energy and biomass. NSM is being implemented by the Ministry of New and Renewable Energy (MNRE).

2.2 As per a note furnished by MNRE, targets of NSM include: (i) deployment of 20,000 MW of grid connected solar power by 2022; (ii) 2,000 MW of off-grid solar applications including 20 million solar lights by 2022; (iii) 20 million sq.m solar thermal collector area; (iv) to create favourable conditions for developing solar manufacturing capability in the country; and (v) support R&D and capacity building activities to achieve grid parity by 2022.

2.3 The Committee were also informed that NSM has adopted a three-phase approach. Phase-I (2010-2013) was designed to focus on capturing the low-hanging options in solar thermal, promoting off-grid systems to serve populations without access to commercial energy and modest capacity addition in grid-based systems. In Phase-II (2013-2017) and Phase-III (2017-2022), capacity will be aggressively ramped up to create conditions for scaled-up and competitive solar energy penetration in the country.

2.4 A representative of MNRE also submitted during oral evidence that in addition to the above, 2000 MW is also to be brought through solar appliances via off-grid.

Road map for achieving 100 GW target under NSM

2.5 According to MNRE, the Government has set the target of Grid-Connected Solar Power Projects to 100,000 MW by the year 2021-22 under the NSM. The total investment in setting up 100 GW will be around ₹6,00,000 crore. In the first phase, the Government of India is providing ₹15,050 crore as capital subsidy to promote solar capacity addition in the country. Accordingly, MNRE has chalked out year-wise targets.

The total target has been envisaged to be divided into rooftop and medium and large-scale grid connected projects as follow:

Category-I	Proposed Capacity (MW)	Category-II	Proposed Capacity (MW)
Rooftop Solar	40,000	Scheme for Decentralized Generation of Solar Energy Projects by Unemployed Youths and Farmers (Small Scale Grid connected projects)	10,000
		Public Sector Undertakings	10,000
		Large Private Sector/IPPs	5,000
		Solar Energy Corporation of India (SECI)	5,000
		Under State Policies	20,000
		Ongoing programmes including past achievements	10,000
Total	**40,000**		**60,000**

Key Achievements

2.6 Asked to indicate the achievements of NSM, MNRE in a note stated that 9012.66 MW of grid-connected solar generation capacity and 382.01 MW equivalent of off-grid solar generation capacity have been installed.

2.7 As per the written note furnished by MNRE, as one of the mission objectives, India is to take a global leadership role in solar manufacturing (across the value chain) of cutting edge solar technologies and target a 4-5 GW equivalent of installed capacity by 2020, including setting up of dedicated manufacturing capacities for polysilicon material to annually make about 2 GW capacity of solar cells. India already has photovoltaic (PV) module manufacturing capacity of about 700 MW, which is expected to increase in the next few years. The present indigenous capacity to manufacture silicon is very low, however, some plants are likely to be set up soon in public and private sector. Currently, there is no indigenous capacity/capability for solar thermal power projects; therefore, new facilities will be required to manufacture concentrator

collectors, receivers and other components to meet the demand for solar thermal power plants. However, as per one media report, the import from China in solar products are very high. India imported a third of China's solar shipments between the months of January to September, 2017. Overall, China's solar exports to India constituted 1.52 percent of its total global exports during 2012, which increased to almost 22 percent in 2016.

2.8 Regarding dependence of the Country on imported technology in the renewable energy sector, the Committee on Public Undertaking, in its 22nd Report presented in 2018, stated as under:

> "The Committee are disappointed to note that the Country remains dependent on imported technology in RE Sector as indigenous technology has not moved ahead much. During the evidence, the Committee have been apprised by the Ministry/IREDA representatives that 85 per cent of the solar panels are still being imported from China as they are cheaper and technologically advanced... The Committee firmly believe that the Country has scientific and technological potential to move forward in RE Sector for which more needs to be done in the field of Research and Development. There is no dearth of talent in the Country. The need of the hour is to encourage Research and Development in RE sector through our premier technological institutions like IITs. The Committee, therefore, are of the view that IREDA/Ministry has to work in the mission mode so as to encourage financing for Research and Development, particularly in RE Sector and financing for smaller project so as to ensure technologically competitive projects besides promoting use of indigenous products through various policy decisions in RE Sector. The concrete initiatives as suggested may be taken and the Committee be apprised accordingly."

2.9 On being asked about the steps taken to reduce the cost of solar panels and cells, a representative of MNRE during oral evidence before the Committee stated as under:

> "...we are funding the IIT, Mumbai for doing research on this sector. We have got a budget of ₹120 crore for R&D. In fact, after taking charge, I had a meeting with the authorities of IIT, Mumbai and we are asking them to increase the solar efficiency, also the life of the solar cells and the storage because storage continues to be a perpetual problem for solar power**."**

2.10 Giving details of funding in academic institutions to undertake research to increase the solar cell efficiency, life of the solar cells and the storage capacity of the solar cells, MNRE in a written reply has stated the following:

"Solar cells are the basic building blocks of any photovoltaic (PV) system the efficiency of which depends in part on the efficiency of the constituent solar cells. Improvement in efficiency of solar cells is central to the concept of low-cost electricity or viable photovoltaic systems as in addition to enhanced harnessing of solar energy, increase in cell and, in turn, the module efficiency also brings down the cost of the balance of systems (BOS). The land area required also reduces proportionately. Thus, increasing cell efficiency has been a major topic of research with the academia and the PV industry alike. MNRE has been sponsoring research projects in this area since the announcement by the GOI of the JNNSM in 2010. It was realized that in addition to the implementation of the PV power plants based on bought out PV modules, there has to be adequate support to the R&D efforts in country on the programme dealing with improvement in solar cell efficiency. It is well known that PV industry at present is heavily dependent on the crystalline silicon solar cell technology as of the various solar cell technologies available today, this happens to be the most developed and reliable. However, development of crystalline silicon solar cell technology requires huge capital in terms of process and test equipment as well as infrastructure which is well beyond the means of university research. Therefore, the PV industry is far ahead of the academia in the area of development in crystalline silicon solar cells in the country. However, with a long term objective of going beyond and setting a trend for the industry in R&D based on crystalline silicon solar cells, a few R&D hubs have been set up by the GOI such as in IIT Bombay (NCPRE Ph I and II) and IIEST, Shibpur with large investment. In addition, industrial research centre such as BHELASSCP has also been supported to meet the requirement of the solar cell industry. The R&D projects sponsored by the MNRE mostly fall in this category as shown in the attachment. The total amount of money spent by MNRE in solar cell R&D exceeds ₹119 Cr. The major part of this investment is on crystalline silicon solar cell research with a small part also diverted to alternate thin film PV research. On energy storage also, MNRE have sanctioned various projects for batteries. As far as the result of the investment is concerned, solar cell efficiency on mono crystalline silicon solar cells have reached 18.5-19% at IIT Bombay and BHELASSCP. The organic solar cells/mini panels at IIT Kanpur have reached about 5% efficiency. The DSSC mini panels at IICT NCL Pune have reached a maximum efficiency of 7%. The perovskite based small area cells at IIT Bombay have reached a maximum efficiency of >20. The heterojunction solar cells at BHEL ASSCP have shown >16% efficiency. IIEST has demonstrated efficiency of 1 sq.cm micromorph solar cells at over 11%."

Phase-I of NSM (2010-2013)

2.11 Regarding the performance of Phase-I of the Mission, MNRE in a written note furnished the following information:

"The Phase-I comprises of two sub-components viz., (i) 1,000 MW of large grid solar plants connected to 33 kV and above grid line, and (ii) 100 MW of rooftop and small solar plants connected to grids below 33 kV.

i) 1000 MW Capacity Grid-Connected Solar Power Projects implemented through NVVN: This scheme covered large solar power plants of total 1,000 MW capacity connected to grid at 33 kV and above - 500 MW capacity each based on Solar Thermal (ST) and Solar Photovoltaic (SPV) technologies. It includes three stages: (i) Migration Scheme (ii) NSM Phase-I, Batch-I and (iii) NSM Phase-I, Batch-II.

Migration Scheme: With a view to facilitate quick start-up to NSM and also speedier implementation of the then on-going projects under advanced stage of implementation in different States, this scheme was introduced in February, 2010 to allow the migration of such projects to NSM. A total of 16 projects of 84 MW capacity (13 nos. of 54 MW Solar PV and 3 nos. of 30 MW Solar Thermal) were approved under this scheme for long-term procurement of power by NTPC Vidyut Vyapar Nigam Limited (NVVN) at Central Electricity Regulatory Commission (CERC) notified tariff for 2010-11 viz. ₹17.91/unit for SPV and ₹15.31/unit for ST. 11 nos. SPV projects of 48 MW capacity and one ST project of 2.5 MW capacity have been commissioned under this scheme.

NSM Phase-I, Batch-I & Batch-II: Under NSM Phase-I, Batch-I and Batch-II, solar power projects were allotted through a process of reverse bidding. Bids for same were invited in two batches: Batch-I of 150 MW SPV and 470 MW ST in August, 2010 and Batch-II of 350 MW SPV in August, 2011. In Batch-I, the eligible project capacities were 5 MW for SPV and up to 100 MW for ST. 30 nos. SPV Projects with an aggregate capacity of 150 MW and 7 nos. of ST Projects with an aggregate capacity of 470 MW were selected. The bid tariffs for SPV projects were in the range of ₹10.95-12.76/unit, with average of ₹12.11/unit and for ST projects in the range of ₹10.49-12.24/unit, with weighted average of ₹11.48/unit. 26 nos. SPV projects of aggregate 140 MW capacity and 3 nos. ST projects of aggregate 200 MW capacity have been commissioned under NSM Phase-I, Batch-I.

In Batch-II for SPV, the project capacity fixed was 5-20 MW. 28 nos. SPV projects with an aggregate capacity of 350 MW were selected. The tariff for the selected SPV projects was ranging between ₹7.49-9.44/unit, with weighted average of ₹8.77/unit. 26 nos. SPV projects of aggregate 330 MW capacity have been commissioned under NSM Phase-I, Batch-II. A 5 MW SPV project by Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC) has also been set up under the MNRE bundling scheme of NSM Phase-I. Thus, under NSM Phase-I, 523 MW solar PV projects and 202.5 MW solar thermal power projects have been commissioned under the bundling scheme.

Power generated from the commissioned plants is being purchased by NVVN and being sold to State Utilities/DISCOMS under a mechanism of bundling with power from unallocated quota of power from coal based stations of NTPC Ltd. on equal capacity basis to effectively reduce the average per unit cost of bundled solar power to the purchasing Utilities. A Payment Security Mechanism involving a revolving fund of ₹486 crore has been put in place to ensure timely payments to developers in the event of delays/defaults in payments by the purchasing State Utilities to NVVN.

ii) 100 MW capacity Solar Power Plants: MNRE announced the Guidelines namely Rooftop PV and Small Solar Power Generation Programme (RPSSGP) for solar power plants connected to distribution network (Below 33 kV) in June 2010. The aim of the scheme was to encourage the States to declare their Solar Policy for grid-connected projects focusing on distribution network and to strengthen the tail-end of the grid. The purpose of the scheme was also to encourage as many States as possible to set up small solar grid-connected projects. It also helped States to create a database of performance of solar plants under different climatic and grid conditions. This was considered necessary for large-scale replication in future, particularly for meeting rural needs in the next phase of the Solar Mission.

The role of the Ministry was limited to providing a fixed Generation-Based Incentive (GBI) to the State utilities at a rate equal to the difference of the CERC tariff for 2010-11 (₹17.91 per kWh) and a reference rate of ₹5.5 per kWh. The projects were registered with IREDA through a web-based process.

78 projects were selected to set up 98 MW capacity projects from 12 States. Against this, 71 projects of total capacity 90.80 MW have been connected to grid.

Off-grid Solar Applications including Solar Heating

The guidelines for implementation of off-grid solar applications were also announced on 16th June 2010. A provision of 30% capital subsidy and/or soft loan @ 5% was made for general category states. In case of solar photovoltaic applications, a capital subsidy limited to a maximum of 90% of the benchmark cost is available for Government-driven projects in the special category states viz. NE, Sikkim, J&K, Himachal Pradesh and Uttarakhand and also the international border districts and islands, keeping in view special needs of the region and overall policy of the Government. IREDA was assigned the task to provide refinance to the interested banks to enable them to offer loans to consumers at 5% annual interest rate. In order to encourage multiple channel partners to access support and reach out to the people, a process of accreditation of solar system integrators was introduced by the Ministry. Reputed agencies such as CRISIL, Fitch and ICRA were involved in the process.

Out of 200 MW capacity, Ministry fixed a target of sanctioning 32 MW capacity projects in 2010-11 against which 40.6 MW capacity off-grid solar PV projects were sanctioned in 2010-11. Another 77.471 MWp were sanctioned during 2011-12 against a target of 68 MWp for the year. During 2012-13, 134.5 MWp capacity projects were sanctioned. The total capacity sanctioned during Phase-I thus was 252.5 MW. For solar thermal collector area during the first phase, about

7.01 million square meter of collector area has been installed against a target of 7.0 million."

2.12 Summary of targets and achievements during Phase-I of NSM (2010-13) is as under:

Application Segment	Target for Phase-I (2010-13)	Achievements till March, 2013
Grid solar power (large plants, roof top & distribution grid plants)	1,100 MW	1686.44 MW
Off-grid solar applications	200 MW	252.5 MW (Sanctioned) 117 MW (Installed)
Solar Thermal Collectors (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.)	7 million sq. meters	7.01 million sq. meters

Phase-II of NSM (2013-17)

2.13 The Phase-I of NSM generated a huge interest in the solar sector wherein grid-connected and off-grid projects were commissioned throughout the country. Achievements of Phase-I exceeded the targets set for the period. This momentum has been carried forward to the next phase, i.e. Phase-II. Summary of targets and achievements during Phase-II of NSM is as under:

Application Segment	Target for Phase-II (2013-17)	Achievements till March, 2017
Grid solar power (large plants, roof top & distribution grid plants)	15,900 MW*	10,602.83 MW
Off-grid solar applications	600 MW	713 MW (Sanctioned) 345.5 MW (Installed)
Solar Thermal Collectors (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.)	8 million sq. meters	5 million sq. meters

** Target has been revised after enhancement of capacity*

2.14 About its programmes for the year 2017-18, MNRE informed as under:

"...we have issued tenders of around 22,945 MW in the previous & current financial years. These tenders are at different stages. Out of the tenders of 22,945MW, projects for around 18356 MW have already been awarded/ financial bids opened and remaining projects are under process by various organisations. Projects of around 10048 MW are there for which PPAs have been signed. These projects are expected to be commissioned in current year & next year."

2.15 About State-wise commissioning status of grid-connected solar projects, following information was furnished:

State-wise Commissioning Status of Grid-Connected Solar Projects

Sr. No.	State/UT	Total cumulative capacity till 31-05-17 (MW)
1	Andaman & Nicobar	6.56
2	Andhra Pradesh	1998.83
3	Arunachal Pradesh	0.27
4	Assam	11.78
5	Bihar	111.52
6	Chandigarh	17.32
7	Chhattisgarh	128.86
8	Dadar&Nagar	2.97
9	Daman & Diu	10.46
10	Delhi	40.27
11	Goa	0.71
12	Gujarat	1249.37
13	Haryana	81.40
14	Himachal Pradesh	0.73
15	Jammu & Kashmir	1.36
16	Jharkhand	23.27
17	Karnataka	1082.48
18	Kerala	74.20
19	Lakshadweep	0.75
20	Madhya Pradesh	857.04
21	Maharashtra	452.37
22	Manipur	0.03
23	Meghlya	0.01
24	Mizoram	0.10
25	Nagaland	0.50
26	Odisha	79.42
27	Puducherry	0.08

28	Punjab	809.45
29	Rajasthan	1871.22
30	Sikkim	0.00
31	Tamil Nadu	1697.32
32	Telangana	1609.27
33	Tripura	5.09
34	Uttar Pradesh	336.73
35	Uttarakhand	233.49
36	West Bengal	26.14
37	Other/MoR/PSU	58.31
TOTAL		**12879.64**

CHAPTER - III

NATIONAL MISSION FOR ENHANCED ENERGY EFFICIENCY

3.1 The National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight missions of the National Action Plan on Climate Change (NAPCC). The nodal Ministry is the Ministry of Power (MoP). As per MoP, NMEEE aims to strengthen the market for energy efficiency by creating conducive regulatory and policy regime and has envisaged fostering innovative and sustainable business models to the energy efficiency sector. Elaborating on promoting of energy consumption efficiency in India, a representative of MoP, during an oral evidence before the Committee, has stated as under:

> "… We have an Energy Conservation Act which provides the legal framework for promoting energy consumption efficiency. The Act includes standards, labeling of appliances, equipments, energy conservation building code, energy consumption norms for energy intensive industries also. We have two major organisations through which we are implementing it. One is the Bureau of Energy Efficiency and the other is the Energy Efficiency Services Limited, a joint venture of some of the public sector undertakings under Ministry of Power".

3.2 As per the note submitted by MoP, the Cabinet on 24 June, 2010 had approved the NMEEE, and funding for two years of the 11th Plan period (2010-12) with an outlay of ₹235.50 crore. An amount of ₹15.00 crore was earmarked in the approved outlay of ₹235.50 crore towards augmentation of Bureau of Energy Efficiency (BEE)'s corpus to meet the additional establishment expenditure during 11th Plan. Continuation of NMEEE for the 12th Plan was approved by Cabinet on 6th August, 2014 with a total outlay of ₹775 crore.

Objective of the Mission

3.3 As mentioned in the note furnished by MoP, NMEEE seeks to upscale the efforts to unlock the market for energy efficiency which is estimated to be around ₹74,000 crore and help achieve total avoided capacity addition of 19,598 MW, fuel savings of around 23 million tonnes per year and GHG emissions reductions of 98.55 million tonnes per year at its full implementation stage. NMEEE spelt out four initiatives to enhance energy efficiency in energy intensive industries which are as follows:

- **Perform Achieve and Trade Scheme (PAT)**, a market-based mechanism to enhance the cost effectiveness in improving the Energy Efficiency in Energy Intensive industries through certification of energy saving which can be traded;

- **Market Transformation for Energy Efficiency (MTEE)**, for accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable;

- **Energy Efficiency Financing Platform (EEFP)**, for creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings;

- **Framework for Energy Efficient Economic Development (FEEED)**, for development of fiscal instruments to promote energy efficiency.

Mitigation Activities Undertaken

A. Perform Achieve and Trade (PAT)

3.4 PAT is a regulatory instrument to reduce specific energy consumption in energy intensive industries, with an associated market-based mechanism to enhance the cost-effectiveness through certification of excess energy saving which can be traded. As per a note furnished by MoP, on 30th March, 2012 energy saving targets for 478 designated consumers (DCs) belonging to eight sectors were notified. Consultations are conducted regularly post notification at state and sector level to communicate and inform DCs about the PAT implementation process, and to seek their views and experiences.

3.5 **PAT Cycle - I:** According to the note furnished by MoP, it is stated that in the first cycle of PAT (ended on 31st March, 2015), 478 industrial units in eight sectors (Aluminum, Cement, Chlor-Alkali, Fertilizer, Iron & Steel, Paper & Pulp, Thermal Power, Textile) were mandated to reduce their specific energy consumption (SEC) i.e. energy used per unit of production. Out of 478, 56 are Central Public Sector Undertakings (PSUs), 6 Co-operative, 327 Private and 89 State PSUs. Overall, the SEC reduction targets aim to secure 4.05% reduction in energy consumption in these industries totaling an energy saving of 6.686 (mtoe). An achievement of savings upto 8.67 mtoe has been reported at the end of PAT Cycle - I. The details of PAT Cycle - I coverage

and outcome are given in **Appendices - I & II**. The sector-wise energy savings achieved during PAT Cycle - I has been highlighted below:

S. NO.	Sectors	No. of Identified DCs	Annual Energy Consumption (Million toe)	Target of Energy Reduction (Million toe)	Actual Savings (Million toe)
1	Aluminium	10	7.71	0.46	0.73
2	Cement	85	15	0.82	1.44
3	Chlor- Alkali	22	0.88	0.05	0.13
4	Fertilizer	29	8.2	0.48	0.83
5	Iron & Steel	67	25.3	1.49	2.10
6	Paper &Pulp	31	2.09	0.12	0.26
7	Textile	90	1.2	0.07	0.12
8	Thermal Power Plant	144	105	3.21	3.06
	Total	**478**	**164.97**	**6.68**	**8.67**

3.6 When asked what is being done in Thermal Power generation sector for reducing energy consumption, the representative of MoP, during oral evidence before the Committee has stated as under:

> "... थर्मल में ऑलरेडी ये स्टेप्स लिये जा रहे हैं, जैसे सुपर क्रिटिकल टेक्नोलॉजी,अल्ट्रासुपर क्रिटिकल टेक्नोलॉजी आ गयी हैं, लेकिन उसका रिजल्ट आने में समय लगता है। प्लांट कमीशन होने में समय लगता है, पुरानी कैपेसिटी जब फेज आउट हो जायेंगी तो ये कंजम्प्शन नॉर्म्स इम्मिडिएटली चेंज हो जायेंगे।उस दिशा में काम हो गया है, शुरुआत हो गई है लेकिन फिगर्स में अभी ऐसा इंपैक्ट नहीं आया है। अगली साइकिल में चलकर उसका इंपैक्ट डैफिनेटली नज़र आएगा। थर्मल में भी हम सुपर क्रिटिकल टैक्नोलाजी से पावर जनरेट करने लगेंगे जब हम पुराने आउटडेटेड प्लांट्स को फेज़ आउट कर लेंगे। यह काम आनगोइंग है। यह अपने हर साइकिल में मानीटर करते हैं। अगली साइकिल भी है पैट की। यह पैट का इंसैंटिवाइज़ेशन भी है जिसको ये एक्सप्लेन करेंगे।"

3.7 **PAT Cycle - II:** As per the note of MoP, in order to include new sectors and to identify new DCs under PAT Scheme, "Deepening study" – identifying new DCs in existing sectors and "Widening study" – including new sectors of PAT, was carried out before the commencement of the second cycle. Deepening study resulted in identification of 89 DCs from the existing sectors of PAT. Widening study resulted in notification of three new sectors namely Refineries, Railways and DISCOMs under PAT scheme. PAT in its second cycle (2016-17 to 2018-19) seeks to achieve an overall energy consumption reduction of 8.869 mtoe for which energy reduction targets have

been assigned and notified to DCs in these 11 sectors (eight existing sectors and three new sectors). The details of PAT - II coverage and projected outcome are given in **Appendices - III & IV**.

3.8 **PAT Cycle - III:** According to the note of MoP, it is stated that as per the recommendations of the Parliamentary Standing Committee on Energy, Executive Committee on Climate Change under Prime Minister's Office (PMO) and Group of Secretaries, PAT scheme has been proposed to be implemented on a rolling cycle basis where new DCs/sectors will be included every year. In view of this, PAT - III has been notified on 30th March, 2017. PAT Scheme in its third cycle seeks to achieve an overall energy consumption reduction of 1.06 mtoe for which SEC reduction targets have been assigned to 116 DCs from six sectors viz. Thermal Power Plant, Cement, Aluminium, Pulp & Paper, Iron & Steel and Textile. The energy consumption of these DCs is 35.00 mtoe. As PAT scheme is now being implemented on a rolling cycle basis, new DCs will be notified every year.

3.9 On being asked to give details of new technologies innovated/introduced/ adopted for energy efficiency industrial sector-wise and the achievements/outcomes after the application of the new technologies, MoP, in a written reply, has furnished the following:

"Following are some of the new technologies adopted:

- Intelligent soot blowing system
- Variable frequency drives
- Screw compressors
- Waste Heat Recovery System
- Installation of VAM
- Usage of AFR and Kiln
- Using 6thGeneration Cell in Electrolyzer
- Direct Rolling to produce TMT bars
- Coke dry quenching**"**

3.10 MoP has also furnished the sector-wise achievements, best practices and technology upgradation under PAT scheme which are given in **Appendix - V**.

3.11 On being asked about the estimates of the amount of CO_2 emission reduced so far due to PAT scheme, MoP in a written reply has stated as under:

> "At the end of PAT cycle I in March, 2015, energy savings of 8.67 mtoe which is equivalent to around 30 million tonnes of CO_2 mitigation was achieved. Further, it may be noted that energy saving target of 8.76 mtoe for PAT cycle II will be achieved by 2019.
>
> Till date, it is expected a total of 10.49 mtoe energy savings would be achieved which corresponds to avoiding emission of 52.45 million tonnes of CO_2."

3.12 When asked about the details of monetary savings made so far due to the above schemes and efforts, MoP in a written reply has stated as under:

> "It may be noted that the weighted average price of 1 mtoe is ₹10,968 at 2014-15 price of the basket of fuels used by the PAT sectors. Therefore, considering the total savings of 10.49 mtoe, this savings in monetary terms till date comes to around ₹11,483 crores."

3.13 As per MoP, units which are able to achieve SEC level that are lower than their targets can receive energy savings certificates (ESCerts) for their excess savings. The ESCerts could be traded on the Power Exchanges and bought by other units under PAT who can use them to meet their compliance requirements. Units that are unable to meet the targets either through their own actions or through purchase of ESCerts are liable to financial penalty under the EC Act.

3.14 BEE has prepared Sector Specific Form-1 (annual energy return form) along with Sector specific Normalization Factors to streamline the monitoring and verification (M&V) process. The sector/sub-sector specific Normalization Factors were developed to neutralize the effects on SEC in the assessment year as well as baseline year so that undue advantages or disadvantages could not be imposed on any DCs while assessing the targets. For development of such factors, Committees/Sub-committees were formed for each sector/sub-sector with representation from DCs as well.

3.15 It has also been informed that BEE has put in place a process of accreditation of Energy Auditors who will be engaged to execute the M&V process of DCs to assess their performances. Development of ESCerts trading infrastructure is in process in

collaboration with Central Electricity Regulatory Commission (CERC). When asked about the total volume of Carbon which has been traded till date by DCs under ESCerts trading mechanism, DoP in a written note has furnished as under:

> "Trading of ESCerts at the Power Exchanges commenced on 26th September, 2017. A total of seventeen sessions of trading of ESCerts earned in lieu of excess energy saved took place at the Power Exchanges resulting into a total traded volume of about 12.98 lakh ESCerts and a business of about ₹100 crores."

3.16 It has also been stated in the MoP's note that a cadre of professionally qualified energy managers and auditors with expertise in policy analysis, project management, financing and implementation of energy efficiency projects is being developed through certification programme. BEE has been designing training modules and regularly conducting a National level examination for certified energy managers and energy auditors. Accredited energy auditors would undertake mandatory energy audits in energy intensive industry as mandated in EC Act. As on date, there are 219 accredited energy auditors. A graphic representation of PAT mechanism is given in **Appendix - VI**.

B. Market Transformation for Energy Efficiency (MTEE)

3.17 Under MTEE, two programmes have been developed i.e. (i) Bachat Lamp Yojana (BLY) and (ii) Super-Efficient Equipment Programme (SEEP).

3.18 **(i) Bachat Lamp Yojana (BLY):** It is a public-private partnership program comprising of BEE, Distribution Companies (DISCOMs) and private investors to accelerate market transformation in energy efficient lighting. Under this programme, over 29 million incandescent bulbs have been replaced by CFLs.

3.19 In the next phase of BLY, BEE will promote use of LED lights using the institutional structure of BLY Programme. BEE provides support to Rural Electrification Corporation (REC) for framing technical specification and monitoring and verification of the energy savings from the LED bulbs distributed to BPL households. BEE will also undertake outreach activities to promote large-scale adoption of LEDs. It has also been stated, during the oral evidence of MoP before the Committee, that there are about 1.25 crore street lights in this country and all of them will be replaced by LED lights by 2019.

3.20 On the issue of certain LED bulbs supplied by the Government becoming not functional in 2-3 months, a representative of MoP, during oral evidence, has submitted as under:

> "हमने करीब 25 करोड़ एलईडी बल्ब्स पूरे देश में बांटे हैं। मैं आपकी बात से पूरी तरह से सहमत हूं। कुछ एक पॉकेट्स में थोड़ी बहुत समस्या आई है। हमने बिना सवाल पूछे हुए, जितने भी बल्ब खराब हुए थे, वे सारे हमने रिप्लेस किए हैं। आज की तारीख में यह 70 रुपये का बल्ब है, जो हम देते हैं। रिटेल में यही बल्ब सवा सौ से डेढ़ सौ रुपये का मिलता है। कंपनीज जो हमें सप्लाई कर रही हैं, वे हैं फिलिप्स, ओसराम, क्रांप्टान ग्रीव्स, जो देश की टॉप मोस्ट कंपनीज हैं, वे सब हमें सप्लाई कर रही हैं।"

3.21 In a written reply, MoP has furnished the details of the physical outcomes of BLY as under:

- "BLY Clean Development Mechanism (CDM) program of activities was registered with United Nations Framework Convention on Climate Change (UNFCCC) on 29 April, 2010.

- 50 CDM project activities (CPAs) from Andhra Pradesh, 20 CPAs from Kerala, 7 CPAs from Karnataka, 2 CPAs from Goa, 5 CPAs from Delhi and 7 CPAs from Punjab are included in registered Program of Activities (PoA).

- 29 million CFLs have been distributed under BLY scheme during XI Plan.
- An avoided Generation Capacity of 4115 MW has been achieved by CFLs distribution under BLY scheme.

  The monitoring and verification process of BLY PoA has commenced for issuance of carbon emission reduction (CERs) for the completed projects. Based on the monitoring and verification report of BEE, 20,00,120 CERs equivalent to as many tones of CO_2 reduction have been issued till now by UNFCCC."

3.22 On being asked about any plan for replacing the old and inefficient wires and switches with new efficient ones as part of BLY and if not, to give reasons, MoP in a written reply has stated that there are no such plans under the energy efficient schemes as part of BLY and MoP has not given any reason for the same.

3.23 **(ii) Super-Efficient Equipment Programme (SEEP):** As per a note furnished by MoP, SEEP is a program designed to bring market transformation for super-efficient

appliances by providing financial stimulus innovatively at critical points of intervention. Under this program, ceiling fan has been identified as the first appliance to be adopted. The goal is to support the introduction and deployment of super-efficient 35 W ceiling fans, as against the current average ceiling fan sold in Indian market with about 70 W rating. Super-Efficient Equipment Program for ceiling fans is being revisited in light of the demand aggregation model for LEDs. SEEP for other appliances such as refrigerators, air conditioners etc. are being explored for future coverage under the programme. In a written reply, MoP has stated that EESL has initiated action to procure and deploy super-efficient ACs & fans.

3.24 When asked to comment on Japan's 'Top Runner' programme in which the government gives incentives for the five best performing appliances developed by the industry during a year which in turn encourages industries to do a lot of research and development and stay at the top globally, MoP in a written reply has stated the following:

> "BEE developed star rating programme for efficient appliances, which has a similar objective as the top runner programme of Japan.
>
> Every year on Energy Conservation Day (14 December), the Ministry or Power supported by BEE, distributes national energy conservation awards to best performing energy efficient industries, manufacturers, buildings, etc.
>
> This year onwards the best performing appliances will be adjudged "Appliance of the Year" in various categories such as air conditioners, refrigerators, etc. This is expected to encourage the industries to do a lot of research and development, and stay at the top globally."

3.25 Regarding replacement of all lighting system, ACs and fans in all the Government buildings in Delhi, a representative of MoP has submitted as under:

> "सर, यह चार पब्लिक सैक्टर्स का एक ज्वाइंट वेंचर है। हम यह एनर्जी एफीशिएंसी के मार्केट बेस्ड प्रोग्राम्स चला रहे हैं। हमें भारत सरकार से कोई फंडिंग नहीं मिलती है। All the programmes are self-sustaining. LED bulb is one of them. मैं पहले बिल्डिंग्स के बारे में बताना चाहूंगा कि अभी हमने सीपीडब्ल्यूडी के साथ एक एग्रीमेंट किया है कि अभी पहले फेज़ में जितने भी दिल्ली में बड़े भवन हैं, सारी की सारी लाइटिंग, एयरकंडीशनिंग और पंखे अपनी कॉस्ट पर हमने चेंज किए और उनको 25 से 30 प्रतिशत बिजली की बचत में गारंटी दी। वह हमको वहां से पैसा वापस कर रहे हैं, जो उनकी बचत हुई। नीती आयोग में हमने किया है, नीती आयोग में करीब 48 पर्सेंट की सेविंग पिछले 6 महीने से लगातार आ रही है।"

C. Energy Efficiency Financing Platform (EEFP):

3.26 EEFP is one of the important initiatives under NMEEE with the objective to provide a platform to interact with financial institutions and project developers for implementation of Energy Efficiency projects. Under this programme, MoUs have been signed with financial institutions to work together for development of energy efficiency market and for identification of issues related to this market development. MoUs are already being signed by BEE with M/s. PTC India Ltd., M/s. SIDBI, Tata Capital and IFCI Ltd. to promote financing for Energy Efficiency projects.

3.27 BEE has released its publications - "Success Stories for Energy Efficiency Projects Financed in India" and " Training Manual for Energy Efficiency Financing in India". This booklet of 50 success stories of Energy Efficiency projects financed by SIDBI covers 20 industrial sectors across the country to adopt energy efficient technologies and processes. The training manual covers all the training modules/presentations required for the understanding of energy efficiency projects and their characteristics, and it aims to help in technical/financial evaluation of EE projects.

3.28 Two new categories for Financial Institutions and for the best business models were also introduced in the National Energy Conservation Awards (NECA) 2015 for encouraging financing in Energy Efficiency sector.

D. Framework for Energy Efficient Economic Development (FEEED)

3.29 FEEED seeks to develop fiscal instruments to promote energy efficiency including innovative fiscal instruments and policy measures like the Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) and Venture Capital Fund for Energy Efficiency (VCFEE).

(i) Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)

3.30 PRGFEE is a risk-sharing mechanism to provide financial institutions (banks and NBFCs) with a partial coverage of risk involved in extending loans for energy efficiency projects. The guarantee will not exceed ₹10 crore per project or 50% of loan amount, whichever is less. Government of India has approved funds of worth ₹312 crore for

PRGFEE. Sectors covered under PRGFEE are government buildings, private buildings having commercial or multi-storey residential accommodations, municipalities, SMEs and industry. The status of Implementation/Activities of PRGFEE is as under:

i. Under PRGFEE, MoP has constituted Supervisory committee for monitoring the implementation of PRGFEE;

ii. BEE has appointed a consortium of RECPDCL-REC-EESL as Implementing Agency (IA) for operationalizaton of PRGFEE in July 2015;

iii. Till date five financial institutions have been empanelled under PRGFEE i.e. Yes Bank, Andhra Bank, Tata Cleantech, IDFC Bank and IndusInd Bank;

iv. Operations Manual for PRGFEE has already been approved and pipeline of few projects have been created.

v. To operationalize the fund, PRGFEE Rules 2016 have been notified by MoP on 26th May 2016.

(ii) Venture Capital Fund for Energy Efficiency (VCFEE)

3.31 It is a fund to provide equity capital for energy efficiency projects. A single investment by the fund shall not exceed ₹2 crore. The Fund shall provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicles or ₹2 crore, whichever is less. Sectors covered under VCFEE are government buildings, private buildings and municipalities. Government of India has approved funds of worth ₹210 crore for VCFEE in XII Plan. Status of the Implementation of VCFEE is as under:

i. The Trust of VCFEE has been constituted as provisions of Indian Trust Act 1882 and trust deed was registered with jurisdictional sub-registrar Government of Delhi;

ii. Board of Trustees for VCFEE has been constituted;

iii. Fund Manager for operationalization of VCFEE has been identified;

iv. VCFEE rules notified on 31st March, 2017.

Year-wise Allocation of Funds and Expenditure

3.32 As per a note furnished by MNRE, this mission was approved by Cabinet in its meeting held on 24th June, 2010, along with the funding for two years of the XI Plan period (2010-12) with an outlay of ₹235.50 crore. For the XII Plan the mission was continued with the budgetary allocation of ₹775 Crore. The funds received and expenditure against the allocation during the XI and XII Plan is as under:

Financial Status of NMEEE			
BUREAU OF ENERGY EFFICIENCY			
			(₹ in crore)
YEAR	BE	RE	EXPENDITURE
2010-11	125.00	108.30	108.30
2011-12	110.35	29.57	29.57
2012-13	232.00	51.00	27.00
2013-14	283.00	0.00	0.00
2014-15	81.15	24.14	16.15
2015-16	31.80	26.80	26.80
2016-17	50.83	19.03	0.00
TOTAL	**914.13**	**258.84**	**207.82**
The projected outlay for next 3 years till the end of 14th Finance Commission period (2017-20)			
2017-18	40.90		
2018-19	182.55		
2019-20	206.55		
TOTAL	**430.00**		

3.33 When asked to comment on the above budgetary provision in which the total BE till 2016-17 is ₹914.13 crore whereas RE is ₹258.46 and the total actual expenditure is only ₹207.82 which indicates poor performance of NMEEE, a representative of MoP during oral evidence has submitted as under:

> "...इसमें जो दो कंपोनेंट पहले प्रावधान थे, क्योंकि उस वक्त उसका एक्सपेंडीचर उस समय नहीं होनाथा, इसलिए उसको बी.ई. में कम किया। दो फंड थे, जो 300 करोड़ और उसके अलावा 100 करोड़ का एक फंड था,

जिसमें सीलिंग फैन, सुपर एफीशिएंट फैन को बनाने का प्लान था। जो फाइनली यह डिसाइड हुआ कि बिना किसी गवर्नमेंट के इंसेंटिव के जिस तरह एलईडी का प्रोग्राम चल निकला है, वैसे ही एफीशिएंट फैन का प्रोग्राम चलाने की बात हुई है। यह अभी फाइनल स्टेज में है। 100 करोड़ रुपये, 300 करोड़ रुपये और 400 करोड़ रुपये इसमें से हम सिर्फ 70 करोड़ रुपये ही विड्रा कर पाए हैं।"(V pg 24 para 4, pg 25 para 2, 4, 6)

3.34 On being asked the reasons for the drastically decreased RE for each year, the Ministry has furnished that the RE was decreased due to the delay in the approval of rules for PRGFEE and VCFEE and the XII Plan Scheme was submitted in 2012-13 and got approved only in 2014-15. The Ministry has furnished the below list of activities for which the above referred budget was allocated:

Sl. No.	Activities	2010-11	2011-12
1.	Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) & Venture Capital Fund for Energy Efficiency (VCFEE)	49.92	22.07
2.	PAT Scheme	58.38	7.50

Sl. No.	Activities	2012-13	2013-14	2014-15	2015-16	2016-17
1.	PAT	0	0	10.46	22.72	0
2.	EEFP	0	0	2.58	1.08	0
3.	PRGFEE	27	0	0	0	0
4.	VCFEE	0	0	0	0	0
5.	SEEP	0	0	1.86	2	0
6.	BLY	0	0	1.25	1	0

3.35 On being asked how MoP is planning to assist DCs to overcome the technical and financial challenges in investing in Energy Efficient projects, MoP, in a written reply, has submitted as under:

"Capacity building workshops and training have been organized by BEE and other partners. ESCerts have inbuilt financial incentives for investments in energy efficiency endeavours by the DCs.

The Ministry, through BEE, is assisting the DCs through various initiatives such as Capacity Building of Designated Consumers by conducting trainings, workshops and sharing best practices among their peers. The Ministry is also providing regular technical assistance to the DCs by creating interactions between technology providers, innovators and facilitating pilot projects related to Energy Efficiency.

Two financial instruments, namely PRGFEE for providing risk guarantee and VCFEE for providing last mile equity, have been created to support energy efficiency projects.

BEE is also exploring possibilities of creating a dedicated financial institution in the form of an Non Banking Financial Company (NBFC) for focused channeling of financial resources to DCs and Energy Services Companies (ESCOs) for large uptake of energy efficiency projects leveraging finance from government and other bilateral and multilateral financial institutions."

CHAPTER - IV

NATIONAL WATER MISSION

4.1 According to the Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR,RD&GR), the implementing Ministry of National Water Mission (NWM), the main objective of NWM is “conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management”. The five identified goals of the Mission are: (a) comprehensive water database in public domain and assessment of impact of climate change on water resource; (b) promotion of citizen and state action for water conservation, augmentation and preservation; (c) focused attention to vulnerable areas including over-exploited areas; (d) increasing water use efficiency by 20%; and (e) promotion of basin level integrated water resources management.

4.2 As per the mission document in the MoWR,RD&GR website, various strategies for achieving water use efficiency have been identified which lead to integrated planning for sustainable development and efficient management with active participation of the stakeholders after identifying and evaluating the development scenario and management practices towards better acceptability on the basis of assessment of the impacts of climate change on water resources based on reliable data and information.

4.3 According to MoWR,RD&GR, relatively very large temporal and spatial variation in rainfall and consequently in the river flow and ground water aquifers is an important feature of the water resources in India. Although the impact of climate change on water resources has not been accurately quantified, various studies indicate that the likely impact of climate change on water resources could contribute to further intensification of the extreme events. Further, the features of water resources - both the availability and the quality - may also be considerably affected by the changes in the forest cover. Realizing that the various processes which influence the hydrologic cycle are of dynamic nature, precise quantification of the impact specifically due to climate change may not be a simple task and it would be necessary to make suitable assumption at the initial stages and undertake detailed simulation studies with more and more data as

they become available with time. However, the likely impact of climate change on water resources could be in the form of:

- Decline in the glaciers and the snowfields in the Himalayas;
- Increased drought-like situations due to overall decrease in the number of rainy days in many parts of the country;
- Increased flood events due to overall increase in the rainy day intensity;
- Effect on groundwater quality in alluvial aquifers due to increased flood and drought events;
- Influence on groundwater recharge due to changes in precipitation and evapo-transpiration; and
- Increased saline intrusion of coastal and island aquifers due to rising sea levels.

4.4 From the above, it is apparent that in the context of likely impact of climate change on water resources, the most vulnerable areas in India would include (a) drought prone areas, (b) flood prone areas, (c) the coastal regions, (d) the region with deficient rainfall, (e) areas with over-exploited, critical and semi-critical stage of ground water development, (f) water quality-affected areas, and (g) snow-fed river basins.

4.5 For achieving the objectives of NWM, long-term sustained efforts both in terms of time-bound completion of identified activities and ensuring the implementation of identified policies and enactment of necessary legislation through persuasion at different levels with the State Governments have been envisaged.

4.6 The global warming may affect the hydrological cycle which could result in further intensification of temporal and spatial variations in precipitation, snow melt and water availability. The report on “India’s Initial National Communication to the United Nations Framework Convention on Climate Change” published by MoEF&CC in the year 2004 identifies the following projected impacts of climate change on water resources:

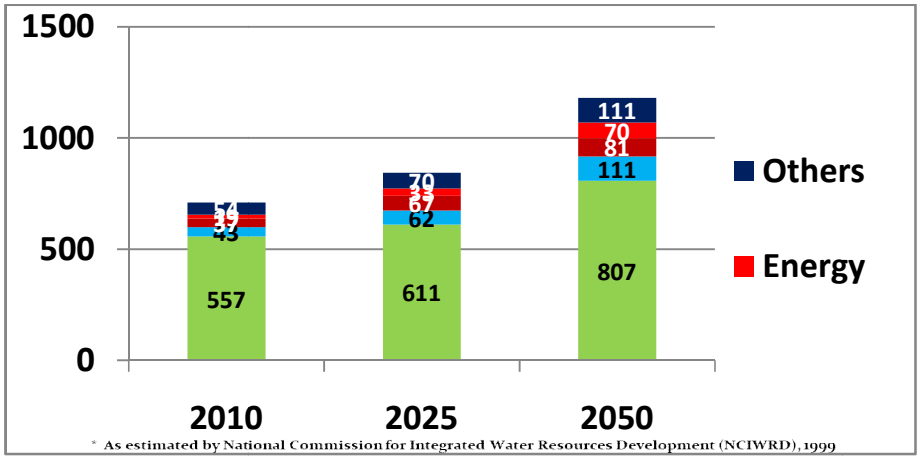
> “It is obvious that the projected climate change resulting in warming, sea level rise and melting of glaciers will adversely affect the water balance in different parts of India and quality of ground water along the coastal plains. Climate

change is likely to affect ground water due to changes in precipitation and evapo-transpiration. Rising sea levels may lead to increased saline intrusion into coastal and island aquifers, while increased frequency and severity of floods may affect groundwater quality in alluvial aquifers. Increased rainfall intensity may lead to higher runoff and possibly reduced recharge."

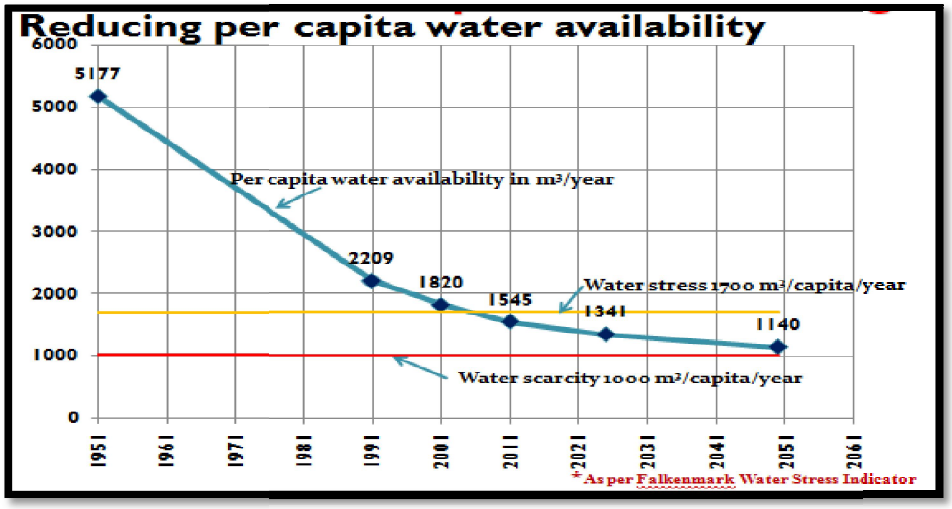
Water Resources Scenario of India

4.7 India constitutes 2.45% of world's land area with a population of 17.5% of the world. India has 4% of World's Renewable Water Resources with water availability 1545 cubic metre/per person/year. There is a water scarcity of 1000 cubic metre/person/year.

4.8 Total precipitation of India (rainfall and snowfall) currently is 4000 billion cubic metre (BCM). Annual total availability of water is 1869 BCM. Total annual utilizable water is 1123 BCM, which is 60% of the total annual available water. Out of this, surface water constitutes 690 BCM and that of ground water is 433 BCM. Current utilization of surface water is 450 BCM (65%) and that of ground water is 231 BCM (58%) which presently meets the demand but is inadequate for future demand. The table below shows the increasing trend of demands for water for various purposes:



4.9 The table below shows the reducing per capita water availability over the years:



Financial Allocation and Expenditure

4.10 MoWR,RD&GR has furnished the financial allocation and expenditure on implementing NWM since 2012-13, details of which are as under:

Year	Budget Estimate (BE) (₹ Crore)	Revised Estimate (RE) (₹ Crore)	Expenditure (₹ Crore)
2012-13	0.00	0.00	0.00
2013-14	110.00	2.00	0.71
2014-15	40.00	1.45	1.29
2015-16	20.00	9.00	6.74
2016-17	25.00	5.00	4.48
2017-18	15.00	-	

A. Comprehensive Water Database in Public Domain and Assessment of Impact of Climate Change on Water Resource

4.11 As per presentation made by MoWR,RD&GR, details of water stress blocks/units are given below:

Categorization	No. of Blocks (2009)	No. of Blocks (2011)	No. of Blocks (2013)	
Over Exploited	802	1071	1034	
Critical	169	217	253	
Semi-critical	523	697	681	
Saline	71	92	96	

4.12 As for establishment of Hydrological Observation Stations and Satellite-based Telemetry, it has been informed that for Hydrological Observation Stations, 702 such stations have been established in the XII Plan period and as for Automatic Satellite based Telemetry system, 65 such systems have been established during the same period.

4.13 Assessing for impact of climate change on river basin, it was informed during presentation that Research Studies at IITs, IISc, NITs, NIH are being supported for the following basins for which works are awarded as per the table below:

River Basin	Institute
1.Mahanadi	IISc Bengaluru
2.Mahi and Inland drainage,	MNIT, Jaipur
3.Luni	IIT,Jodhpur
4.Tapi	SV NIT,Surat
5.Subernarekha	IIT, Kharagpur
6.Sabarmati	IIT,Gandhi Nagar
7.Western flowing rivers from Tadri to Kanyakumari basins	IIT, Bombay

8.Statistical Downscaling	**IIT, Bombay**

B. Promotion of Citizen and State Action

4.14 For capacity building of officials and the community, MoWR, RD&GR has furnished the following:

- "Built Institutional Partnership with- NERIWALM, NIRD &PR, WALAMTARI, WALMI (Aurangabad), CWPRS, CWRDM, ICAR-IIWM, HIRMI, NIH, IGNP, India NPIM and TISS.
- Target Group:
  - State Government Officials
  - Local Bodies- Panchayat Raj Institutions
  - Water User Associations
  - Civil Society
- Till date: 668 Trainings conducted and 56,768 stakeholders are trained during 2013-17"

C. Focus Attention to Vulnerable Areas Including Over-exploited, Critical and Semi-critical Areas

4.15 As per MoWR, RD&GR, aquifer mapping is going on and the target for XII Plan is 0.9 million km^2 for XII Plan out of 2.3 million km^2 in the following 8 states: Haryana, Punjab, Rajasthan, Gujarat, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu and Bundelkhand areas of UP/MP. Some of the achievements under XII Plan period are as under:

- Mapping of 6.31 lakh sq.km upto March 2017 against a target of 8.89 Lakh sq.km
- Delineation of Contamination – free aquifers in the Arsenic – affected States of UP, Bihar, Jharkhand & West Bengal.
- Mega Recharge Project in Tapi River basin, developed based on Aquifer Mapping studies evaluated and approved by the Task Force.
- In drought affected areas of Latur district, 25 wells constructed on sites identified during May & June, 2016 for tackling drinking water crisis.

- Max yield – 5.8 lps, all wells handed over to the state govt.
- Ground Water Management plan developed for reviving Rajgir hot springs.

4.16 MoWR,RD&GR has also informed that through convergence with MGNREGA, 7.86 lakh water conservation structures have been made during 2016-17.

D. Improving Water Use Efficiency

4.17 For improving water use efficiency, a scoping study has been done for the Major-Medium Irrigation Projects and has been completed in association with Asian Development Bank (ADB). Moreover, two Pilot projects at Sanjay Sarovar at Madhya Pradesh and and Dharoi Project at Gujarat. Baseline studies of major/medium water resource projects initiated to assess the present status of water use efficiency are as under:

- NERIWALM, Tezpur – 5 irrigation projects in the North-East (Manipur & Assam)
- WALAMTARI, Hyderabad - 10 irrigation projects (5 in Telengana and 5 in Andhra Pradesh)
- WALMI, Aurangabad – 6 irrigation projects (Maharashtra)
- CWRDM, Kozhikode- 5 Irrigation Projects (Kerala)

for Demonstration Project:

- Grey Water to Blue Water –NIH, Roorkee
- Water purification and Desalination (Mota Asota, Dwaraka Dist.)- CSMCRI / CSIR Bhavnagar

4.18 Commenting on the unreliability of water related data in the Country, NITI Aayog, in its publication 'Composite Water Management Index: A tool for Water Management (June 2018) stated as under:

> "… Data systems related to water in the country are limited in their coverage, robustness, and efficiency. First, data is often not available at the adequate level of detail. For example, water use data for domestic and industrial sectors is available at only the aggregate level, and thus provides very little information to relevant policymakers and suppliers. Second, where data is available, it is often

unreliable due to the use of outdated collection techniques and methodologies. For example, groundwater data in India is based on an inadequate sample of ~55,000 wells out of a total ~12 million3 in the country. Finally, siloed information collection and sharing, especially between states, adds significantly to costs and inefficiencies..."

Further,

"India is suffering from the worst water crisis in its history and millions of lives and livelihoods are under threat. Currently, 600 million Indians face high to extreme water stress and about two lakh people die every year due to inadequate access to safe water. The crisis is only going to get worse. By 2030, the country's water demand is projected to be twice the available supply, implying severe water scarcity for hundreds of millions of people and an eventual ~6% loss in the country's GDP2 . As per the report of National Commission for Integrated Water Resource Development of MoWR, the water requirement by 2050 in high use scenario is likely to be a milder 1,180 BCM, whereas the present-day availability is 695 BCM. The total availability of water possible in country is still lower than this projected demand, at 1,137 BCM. Thus, there is an imminent need to deepen our understanding of our water resources and usage and put in place interventions that make our water use efficient and sustainable… There is also an opportunity to improve centre-state and inter-state cooperation across the broader water ecosystem. Water management is often currently viewed as a zero-sum game by states due to limited frameworks for inter-state and national management. This has resulted in seven major disputes regarding the country's rivers, involving 11 states4 , as well as limited policy coordination on issues like agricultural incentives, pump electricity pricing, etc. These issues can be addressed by boosting cooperation at a federal and inter-state level."

4.18 In their 24th Report (action taken report) on the subject 'Ganga Rejuvenation' pertaining to the MoWR,RD&GR, the Committee had recommended as under:

"The Committee takes exception to the manner different studies are denied funds/support by the different Ministries/Departments. While expressing strong concern, the Committee would like the Ministry to convey their concerns to the concerned Ministries as well as to Finance Ministry in the strongest terms. The response thereto may be communicated urgently as and when received as a follow-up to the reiteration of the recommendation by the Committee. The Committee would like to be apprised of the findings of a study being conducted by NIH under its internally funded R&D activities on alternate water supply management strategies in arsenic affected/vulnerable areas: Mapping of Arsenic affected zones/regions in Eastern U.P. (Balia district), the first phase of which was supposed to be completed by the end of March, 2017 as stated in the action taken reply."

4.19 Regarding water quality in different parts of the country, the website of Central Ground Water Board provides the following information:

"85% of rural population of the country uses ground water for drinking and domestic purposes. High concentration of fluoride in ground water beyond the permissible limit of 1.5 mg/l poses the health problem. Nearly the occurrences of fluoride beyond permissible limit (>1.5 mg/litre) has been observed based on the chemical analysis of water samples collected from the groundwater observation wells. The name of the districts having spot values of >1.5 mg/l are given in following table.

S. No.	State	Fluoride	
		No.of districts affected	Districts (in parts)
1.	Andhra Pradesh	19	Adilabad, Anantpur, Chitoor, Guntur, Hyderabad, Karimnagar, Khammam, Krishna, Kurnool, Mehboobnagar, Medak, Nalgonda, Nellore, Prakasham, Rangareddy, Vishakhapatnam, Viziangaram, Warangal, West Godawari
2.	Assam	4	Goalpara, Kamrup, Karbi Anglong, Naugaon
3	Bihar	9	Aurangabad, Banka, Buxar, Jamui, Kaimur, Munger, Nawada, Rohtas, Supaul
4.	Chhattisgarh	12	Bastar, Bilaspur, Dantewara, Janjgir-Champa, Jashpur, Kanker, Korba, Koriya, Mahasamund, Raipur, Rajnandgaon, Suguja
5.	Delhi	6	East Delhi, New Delhi, Northwest Delhi, South Delhi, Southwest Delhi, West Delhi
6.	Gujarat	18	Ahmedabad, Amreli, Anand, Banaskantha, Bharuch, Bhavnagar, Dahod, Junagarh, Kachchh, Mahesana, Narmada, Panchmahals, Patan, Rajkot, Sabarkantha, Surat, Surendranagar, Vadodara
7.	Haryana	14	Bhiwani, Faridabad, Gurgaon, Hissar, Jhajjar, Jind, Kaithal, Kurkshetra, Mahendragarh, Panipat, Rewari, Rohtak, Sirsa, Sonepat
8.	Jammu & Kashmir	2	Rajauri, Udhampur
9.	Jharkhand	6	Bokaro, Giridih, Godda, Gumla, Palamau, Ranchi
10..	Karnataka	20	Bagalkot, Bangalore, Bellary, Belgaum, Bidar, Bijapur, Chamarajnagar, Chikmagalur, Chitradurga, Devangere, Dharwar, Gadag, Gulbarga, Haveri, Kolar, Koppala, Mandya, Mysore, Raichur, Tumkur.
11.	Kerala	1	Palakkad
12.	Madhya Pradesh	19	Bhind, Chhatarpur, Chhindwara, Datia, Dewas, Dhar, Guna, Gwalior, Harda, Jabalpur, Jhabua, Khargone, Mandsaur, Rajgarh, Satna, Seoni, Shajapur, Sheopur, Sidhi.
13.	Maharashtra	8	Amrawati, Chandrapur, Dhule, Gadchiroli, Gondia, Jalna, Nagpur, Nanded,

14.	Orissa	11	Angul, Balasore, Bargarh, Bhadrak, Boudh, Cuttack, Deogarh, Dhenkanal, Jajpur, Keonjhar, Suvarnapur
15.	Punjab	11	Amritsar, Bhatinda, Faridkot, Fatehgarh-Saheb, Firozpur, Gurdaspur, Mansa, Moga, Muktsar, Patiala, Sangrur,
16.	Rajasthan	30	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chhittorgarh, Churu, Dausa, Dholpur, Dungarpur, Ganganagar, Hanumangarh, Jaipur, Jaisalmer, Jalore, Jhunjhunu, Jodhpur, Karauli, Kota, Nagaur, Pali, Rajasamand, SawaiMadhopur, Sikar, Sirohi, Tonk, Udaipur
17.	Tamil Nadu	16	Coimbatore, Dharmapuri, Dindigul, Erode, Karur, Krishnagiri, Namakkal, Perambalur, Puddukotai, Ramnathpuram, Salem, Shivaganga, Theni, Thiruvannamalai, Vellore, Virudunagar
18..	Uttar Pradseh	10	Agra, Aligarh, Etah, Firozabad, Jaunpur, Kannauj, Mahamayanagar, Mainpuri, Mathura, Maunathbhanjan,
19.	West Bengal	8	Bankura, Bardhhman, Birbhum, Dakhin Dinajpur, Malda, Nadia, Purulia, Uttar Dinajpur

Arsenic

Arsenic occurs naturally in the environment as an element of the earth's crust with an abundance of 1.8 ppm by weight. Arsenic combines with other elements such as oxygen, chlorine and sulphur to form inorganic arsenic compounds. Arsenic and its compounds are widely used in agriculture, livestock feed, medicine, electronics, metallurgy, chemical warfare agents etc. Synthetic organic compounds have now replaced arsenic in most of the uses. Arsenic is an element of interest in terms of environmental issues and health impacts.

Transport and distribution of arsenic in environment is complex and there is continuous cycling of different forms of arsenic through air, soil and water. It is introduced in soil from parent rock during pedogenesis and further in ground water during weathering of rocks followed by leaching. It can also be introduced from anthropogenic sources such as arsenical pesticides, fertilizers, irrigation, dust from burning of fossil fuel and disposal of industrial and animal wastes. In ground water inorganic arsenic is present, commonly as arsenate (As V) and arsenite (As III), inter-conversion of which takes place by oxidation-reduction.

Arsenic as a contaminant is significant in terms of its toxic nature with exceedingly diverse manifestations of poisoning. Drinking water is the major pathway for ingestion of arsenic in human system. As per BIS 2012 (IS 10500:2012), the acceptable limit of Arsenic is 0.01 mg/l and the permissible limit in absence of alternate source is 0.05 mg/l. Elevated concentrations of arsenic in ground water are reported from various parts of India but particularly affecting the large parts of the Ganga-Brahmaputra Plains. The aquifers in the alluvial plains embedded within the Late Quaternary deposits are reported to be affected,

with a few exceptions where the Hard rock aquifers are also affected as in Chhatttisgarh and Karnataka states. In India high concentration of arsenic beyond permissible limit of 0.05 mg/l in ground water has been reported from 86 districts of 10 States.

The arsenic concentration in ground water is marked by wide spatial variability. Depth wise the contaminated water is generally found to be confined within 100m in alluvial aquifers

There are different options for remediation of arsenic. As a short term measure, various types of ex-situ removal techniques are adopted, in house-hold scale or community scale. Use of dug wells which are found to be arsenic free are also proposed. As medium and long term measures, alternate arsenic free deeper aquifers (hydrogeologically suitable ones) and surface water based supply may be adopted. Artificial recharge and rain water harvesting is also a viable option for arsenic remediation as it dilutes the concentration. Presently emphasis is given to adopt in-situ removal of arsenic as it is environment friendly because no sludge is produced. However, the success of any arsenic mitigation measures depends upon awareness creation and capacity building of the people residing in the affected areas.

	State	Number of Districts	Names of Districts
1	Assam	18	Sivsagar, Jorhat, Golaghat, Sonitpur, Lakhimpur, Dhemaji, Hailakandi, Karimganj, Cachar, Barpeta, Bongaigaon, Goalpara, Dhubri, Nalbari, Nagaon, Morigaon, Darrang & Baksha
2	Bihar	15	Begusarai, Bhagalpur, Bhojpur, Buxar, Darbhanga, Katihar, Khagaria, Kishanganj, Lakhisarai, Munger, Patna, Purnea, Samastipur, Saran, Vaishali
3	Jharkhand	1	Sahebganj
4	Chhattisgarh	1	Rajnandgaon
5	Haryana	13	Ambala, Bhiwani, Faridabad, Fatehabad, Hissar, Jhajjar, Jind, Karnal, Panipat, Rohtak, Sirsa, Sonepat, Yamunanagar
6	Karnataka	2	Raichur and Yadgir district
7	Manipur	2	Bishnupur, Thoubal
8	Punjab	6	Mansa, Amritsar, Gurdaspur, Hoshiarpur, Kapurthala, Ropar
9	Uttar Pradesh	20	Bahraich, Balia, Balrampur, Bareilly, Basti, Bijnor, Chandauli, Ghazipur, Gonda, Gorakhpur, LakhimpurKheri, Meerut, Mirzapur, Muradabad, Rai Bareilly, SantKabir Nagar, Shajahanpur, Siddarthnagar, SantRavidasNagar, Unnao
10	West Bengal	8	Bardhaman, Hooghly, Howrah, Malda, Murshidabad, Nadia, N-24

			Parganas, S- 24 Parganas
	10 States	86	

Iron

High concentration of Iron (>1.0 mg/l) in ground water has been observed in more than 1.1 lakh habitations in the country. Ground water contaminated by iron has been reported from the states of Andhra Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, J&K, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal & UT of Andaman & Nicobar.

Nitrate

Nitrate is a very common constituent in the ground water, especially in shallow aquifers. The source is mainly from anthropogenic activities. High concentration of Nitrate in water beyond the permissible limit of 45 mg/l causes health problems. High Nitrate concentration in ground water in India has been found in almost all hydrogeological formations."

CHAPTER - V

NATIONAL MISSION FOR A GREEN INDIA

5.1 The National Mission for a Green India or Green India Mission (GIM) is one of the eight Missions outlined under NAPCC. As per the note furnished by MoEF&CC, GIM aims to both increasing the forest and tree cover as well as increasing the quality of the existing forest cover. The Scheme was proposed for a period of 10 years.

Objective of Mission and Mission Targets

5.2 Broad objectives of GIM as per MoEF&CC are as under:

(i) To increase forest/tree cover to the extent of 5 million hectares (mha) and improve quality of forest/tree cover on another 5 mha of forest/non-forest lands;

(ii) To improve/enhance eco-system services like carbon sequestration and storage (in forests and other ecosystems), hydrological services and biodiversity; along with provisioning services like fuel, fodder, and timber and non-timber forest produces (NTFPs); and

(iii) To increase forest-based livelihood income of about 3 million households.

5.3 According to MoEF&CC, in the 12th Five Year Plan, a physical target of 0.3439 mha (increase in forest/tree cover in 0.1646 mha and improved quality of forest/tree cover in 0.1903 mha) and provision of alternative fuel energy to 0.65027 million households was approved with a financial outlay of ₹2000 crore.

5.4 When asked to give an assessment of the impact of climate change and global warming on India's forests, MoEF&CC, in a written reply has stated as under:

> "...Through the scientific modeling done using RCM (Regional Climate Model) and BIOME model (BIOME4), it is projected that nearly 77% and 68% of the forest grids are likely to be impacted by climate change leading to shifts in forests types in A2 and B2 scenario. Use of the dynamic global response model IBIS (Integrated Biosphere Simulator) predicts the percentage of forested grids expected to undergo vegetation change range from 3.5% in the North-Eastern states to 73% in Chhatisgarh. Already challenged forest eco-systems will become much more vulnerable on account of the altitudinal and latitudinal shift of the species of the forest ecosystems and also on account of increased occurrences of fire, pests/diseases, invasive species, change in species assemblage/forest type, forest die-back and loss of biodiversity."

Fund Allocation and Expenditure

5.5 As per the note furnished by MoEF&CC, GIM got operational in FY 2015-16 after due approval of Implementation Guidelines in November 2014. The fund allocation and expenditure under GIM for last two years is given below:

Year	Budget Allocation	Expenditure (₹ in crore)
2015-16	72.00	70.22
2016-17	42.01	41.62
2017-18	47.80	32.35*
Total	**161.81**	**143.96**

Note: * up to October, 2017

5.6 When asked whether the estimates allocated up the year 2017-18 are sufficient and justified, MoEF&CC, in a written reply has stated as under:

> "Budget Allocation of ₹47.80 Cr. for FY 2017-18 is grossly insufficient. The committed liability of FY 2015-16 and 2016-17 is ₹89.53 Crore, which is more than the budget allocation of FY 2017-18."

Mitigation Activities undertaken so far and their Outcomes/Outputs

5.7 According to MoEF&CC note, the following activities have/are being taken under GIM:

- In the Preparatory Phase of GIM and prior to approval of CCEA, funds to the tune of ₹62.60 crores were released in FY 2011-12 & 3013-14 to 27 States/UTs for undertaking preparatory activities which included institutional strengthening, training, identification of landscapes and preparation of Perspective Plans.

- The GIM Implementation Guidelines were finalized in November 2014.

- The National Governing Council (NGC) headed by the Minister, MoEF&CC and National Executive Council (NEC) headed by Secretary, MoEF&CC were constituted in the month of March, 2015.

- Convergence Guidelines of GIM with Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) and Compensatory Afforestation

Fund Management and Planning Authority (CAMPA) were issued in March and May, 2015 respectively.

- First Regional Workshop on GIM was held at Imphal on 25-26 June, 2015 to address the selection of landscapes for implementation of GIM, monitoring and evaluation mechanism using GIS and convergence approach to be adopted with complimentary schemes and programmes

- The National Executive Committee has approved the Perspective Plan and Annual Plan of Operations (APOs) of ten States namely Uttarakhand, Punjab, Karnataka, Chhattisgarh, Odisha, Mizoram, Manipur, Jharkhand, Andhra Pradesh and Kerala. Funds have been released to only nine States except Jharkhand.

5.8 As per MoEF&CC, the sanction of funds under the Scheme is started from 2015-16 and so far 67651.4 ha physical targets have been sanctioned. The State-wise targets and achievements are given in **Appendix - VII**. The component-wise targets and outcomes of are given below:

(***Phy:*** area in hectares, ***Fin:***₹ in Crore)

Objective/Outcomes	Targets		Achievement	
Improvement in Quality of Forests	Physical	Financial*	Physical#	Financial*
Increase in forest Cover	49406	194.128	32368.7	71.6418
Promoting alternate fuel energy	18245.4	142.660	11015.1	23.7206
Devices for households	41153	14.2185	2500	0.825
Total**	**67651.4**	**351.007**	**43383.8**	**96.1874**

Note: * Physical and Financial Targets include both Centre and State Govt. Share.
#Physical Targets could not be achieved due to paucity of funds.
**Total does not include physical targets of Promoting alternate fuel energy devices.

5.9 One of the experts in his deposition before the Committee, regarding requirement of land for forests in the country to meet India's international commitment on CO_2 sequestration, has stated the following:

"... ग्रीन इण्डिया मिशन कोपेन हेगन में हमने अनाउन्स किया, अभी पैरिस में हमने एक और कमिटमेंट वर्ष 2020-30 तक का कर दिया है कि 2.523 बिलियन टन कार्बन हम अपने फॉरेस्ट में सिक्वैस्टर करेंगे। कोई ऐस्टीमेट नहीं हुआ कि कितनी फॉरेस्ट लैण्ड की जरूरत पड़ेगी। 2.523 बिलियन टन कार्बनडाई ऑक्साइड सिक्वैस्टर करने का मतलब है, कुछ 30 मिलियन हैक्टेयर जमीन की जरूरत पड़ेगी। हमारा टोटल फॉरेस्ट, आज के दिन में 75 मिलियन हैक्टेयर है। अगर हम टोटल फॉरेस्ट एरिया को देखें, बाहर की जमीन को देखें, वेस्ट लैण्ड को देखें, अगर हम पैरिस एग्रीमेंट मीट करना चाहते हैं तो हमें वर्ष 2030 तक 3 करोड़ हैक्टेयर नए फॉरेस्ट लगाने की जरूरत है।"

5.10 When asked to shed light on how the Government is going to manage 3 crore hectare of land required for afforestation/reforestation or to create new forests to meet India's commitment to sequester 2.5-3 billion tonnes of CO_2 during the period 2020-30, Secretary, MoEF&CC, during oral evidence before the Committee has stated as under:

> "महोदय, इसमें ऐसा है कि हम लोगों ने इसका अनुमान लगाया था और 250 से 300 करोड़ टन कार्बन डाई ऑक्साइड का जो सिक्वेस्ट्रेशन करना है, उसके लिए हमें कम से कम 25 से 30 मिलियन हैक्टेयर और फॉरेस्ट जोड़ना पड़ेगा। अभी जो फॉरेस्ट कवर है, वह करीब-करीब 79-80 मिलियन हैक्टेयर के लगभग है। करीब एक तिहाई और एरिया उसमें ऐड करना पड़ेगा, इस तक पहुँचने के लिए। अब इसमें वनों के माध्यम से भी कार्बन सिक्वेस्ट्रेशन होता है और कुछ ओशन मरीन लाइफ के थ्रू भी होता है, जैसे मैनग्रोव्स आदि होते हैं।"

5.11 As per information supplied by the MoEF&CC, physical target of 51387.72 hectare area will be afforested in the year 2016-17. Only 41266.12 hectare area could be covered.

CHAPTER - VI

NATIONAL MISSION ON SUSTAINABLE HABITAT

6.1 The National Mission on Sustainable Habitat (NMSH) is one of the eight missions of NAPCC and was approved by the Prime Minister's Council for Climate Change in June 2010. NMSH is being implemented by the Ministry of Housing and Urban Affairs (MoHUA). NMSH aims at promoting sustainability of habitats through improvements in energy efficiency in buildings, urban planning, improved management of solid and liquid waste including recycling and power generation, modal shift towards public transport and conservation.

Objectives of the Mission

6.2 As per MoHUA, NMSH seeks to promote the following:

- Improvements in energy efficiency in buildings through extension of the energy conservation building code - which addresses the design of new and large commercial buildings to optimize their energy demand;
- Better urban planning and modal shift to public transport - make long-term transport plans to facilitate the growth of medium and small cities in such a way that ensures efficient and convenient public transport;
- Improved management of solid and liquid waste, e.g. recycling of material and urban waste management – with special focus on development of technology for producing power from waste;
- Improved ability of habitats to adapt to climate change by improving resilience of infrastructure, community-based disaster management, and measures for improving advance warning systems for extreme weather events; and
- Conservation through appropriate changes in legal and regulatory framework.

Mission Targets

6.3 MoHUA has listed the following as the key deliverables of the MNSH:

• Development of sustainable habitat standards that lead to robust development strategies while simultaneously addressing climate change related concerns;

• Preparation of city development plans that comprehensively address adaptation and mitigation concerns;

• Preparation of comprehensive mobility plans that enable cities to undertake long-term, energy-efficient and cost-effective transport planning; and

• Capacity building for undertaking activities relevant to the Mission.

Year-wise allocation of Funds

6.4 As per the note furnished by MoHUA, no specific funds have been allocated or are sought for the Mission on Sustainable Habitat, which is being implemented through the four flagship missions/programmes of the MoHUA, which are-.

A. Atal Mission on Rejuvenation and Urban Transformation (AMRUT)

B. Swachh Bharat Mission

C. Smart Cities Mission

D. Urban Transport Programme

6.5 As per MoHUA, the end aim is to adapt and mitigate GHG emissions to achieve sustainability. A report prepared by TERI for the MoHUA for the COP21 summit at Paris, estimated that successful implementation of the above flagship missions has a potential for mitigation of GHG emission amounting to 133 Million Tonnes CO_2eq. by 2021 and 270 Million Tonnes by year 2031.

6.6 Lamenting the mission's focus only on urban habitat by completely forgetting the rural habitat, one of the environmental experts in deposition before the Committee stated the following:

> "On the sustainable habitat, I found it interesting that here habitat does not include rural habitat at all. It has been reduced to urban habitat. It does not include the habitat for other species. We are after all a civilisation of *Vasudhaiva Kutumbakam* that has, even in cities, put aside habitat for other species. So, there is no mention of wildlife habitat, which is also a major climate mitigation area because these are carbon absorbing regions. In terms of the urban habitat, there is an assumption that cities can survive independent of the countryside and that ignoring of the balance between the cities and the countryside and not

allowing the countryside to become so unviable ecologically through climate change, economically through absolutely non-sustainable agriculture. Everyone in the cities with two per cent left on the land which is often talked about by the policy makers is a non-sustainable society. It will explode; it will absolutely explode. Our farmers actually are climate solvers and I will come to that in the Sustainable Agriculture Mission. But bringing the rural areas into this habitat discussion is absolutely important. I work with other countries and Governments where people are realising how important agriculture and soil is for climate mitigation. They have put ceilings on the expansion of cities to not take over fertile soils and fertile land. If we ignore agriculture and agricultural land and only treat habitat as what happens when you come to a city, we will not have the full solution**."**

6.7 When asked to comment on the above observation, MoEF&CC, in a written reply, has furnished the following:

"Development of habitats in rural areas and/or habitat for other species, if left to itself, is generally symbiotic and sustainable. This has been so for thousands of years. Even now, primarily rural and low population density communities such as Auroville or the nations of Norway and Finland are able to develop sustainably and are net greenhouse gas sinks. Urbanisation and industrialization, on other hand, if not made sustainable through proper planning, direction, rules, adaptation and mitigation measures, rapidly affects and deteriorates the environment not only in their own areas but in the other spheres as well. When rural communities increase in size and density and tend to disturb its sustainability, appropriate actions/measures will be taken. Thus the focus will be to improve the urban habitat to achieve national habitat sustainability."

A. Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

6.8 MoHUA, in a written note, has stated that India is poised for rapid economic growth. Such future growth will largely come from economic activities in urban areas as cities today contribute nearly 65% of India's GDP. With increasing urban sprawl, it is estimated that by 2030, this figure would reach nearly 70%. Nonetheless, economic activities would largely depend on mobility of the people dwelling in urban areas. Hence, development of cities through prioritizing urban transport is a step forward in this direction. Urban Transport is a key urban service that imparts efficiency to the city by providing mobility to the workforce and hence best productivity. Nevertheless, traditional models of urban transport can lock us into congestion, undue sprawl and inefficient

resource use. Contemporary models of clean and climate resilient, cost-effective and sustainable public transport not only ensures impetus to commercial activities in urban areas but also improves the quality of life of citizens. Therefore, a complete paradigm shift in favour of Public Transport is greatly essential. Global experience has also shown that an efficient shift to Public Transport can occur only if urban transport is assimilated at the conception stage of land-use and urban planning. As per data provided in https://community.data.gov.in/registered-motor-vehicles-in-india-as-on-31-03-2015/, the number of motor vehicles on our roads was 52.37 million in 2000 which increased to 121.63 million in 2011. The total number of registered motor vehicles in India was 210.02 million as on 31.03. 2015. Moreover, the Committee note that at present 30% population of the Country lives in urban areas which is expected to grow to 40% by 2021 and 50% by 2050. The number of motor vehicles on our roads was 52.37 million in 2000 which increased to 121.63 million in 2011. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT), a Centrally Sponsored Scheme to be implemented during 2015-16 to 2019-20 with an outlay of ₹50,000 crore was launched on 25.06.2015. The bedrock of AMRUT is development of basic urban infrastructure – water supply, sewerage, septage management, storm water drains, urban transport and development of green space and parks with special provision for senior citizens and differently abled-friendly components in 500 cities & towns. The Mission also focuses on reforms in the urban sector.

6.9 The objectives of AMRUT are as follows:

(i) Ensure every household has a tap with assured water supply and a sewerage connection;

(ii) Increase amenity value of cities by developing greenery and well maintained open spaces (e.g. parks); and

(iii) Reduce pollution by switching to public transport or providing facilities for non-motorised transport.

6.10 It is added that focus of AMRUT is on universal coverage of Essential Services beginning with drinking water supply.) Universal coverage of water supply and sewerage connection is a national priority. After achieving this, the city may move to other permitted components like urban transport etc.

6.11 According to the note furnished by MoHUA, State Annual Action Plan (SAAP) of all 36 States/UTs under AMRUT have been approved as under:

SAAP 2015-16:

(i) Total investment (States/UTs and Centre): ₹20,672 crore

(ii) Committed Central Assistance: ₹98,94 crore

(iii) Funds released for SAAP approved in 2015-16: ₹1,979 crore

SAAP 2016-17:

(i) Total investment (States/UTs and Centre): ₹25182 crore

(ii) Committed Central Assistance: ₹11848 crore

(iii) Funds released for SAAP approved in 2016-17: ₹2370 crore

III & Final SAAP:

(i) Total investment (States/UTs and Centre) : ₹31786 crore

(ii) Committed Central Assistance : ₹14248 crore

(iii) Funds released for Final SAAP : ₹2215 crore

In addition, ₹238 crore has been released to States/UTs for A&OE purposes.

Overall progress

(i) Total investment (States/UTs and Centre): ₹77640 crore

(ii) Committed Central Assistance: ₹35,990 crore

(iii) Funds released for SAAP: ₹7701 crore

B. Swachh Bharat Mission

6.12 The Swachh Bharat Mission-Urban (SBM-U) launched on 2nd October 2014 aims at making urban India free from open defecation and achieving 100% scientific management of municipal solid waste in 4,041 statutory towns in the country to be achieved in five years, i.e. by 2nd October 2019.The specific objectives of the SBM-U are mentioned below:

- Elimination of open defecation
- Eradication of Manual Scavenging
- Modern and Scientific Municipal Solid Waste Management
- To effect behavioral change regarding healthy sanitation practices
- Generate awareness about sanitation and its linkage with public health
- Capacity Augmentation for Urban Local Bodies
- To create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance)

6.13 It has also been stated in the written note furnished by MoHUA that a number of policy initiatives have been taken to encourage processing of waste to compost and waste to energy, mandatory use of plastics in road construction, and mandatory use of recycled construction and demolition waste in all construction projects. 145 compost plants are currently functional in the Country while 150 plants are under construction. After construction of these plants, the total compost production will increase from 13.13 lakh ton to 33 lakh tons. 511 mw of power can be produced from municipal solid waste. Currently 7 plants are operational and 53 are being constructed.

6.14 As per MoHUA, estimated cost of implementation of the SBM-U:

- ₹62,009 crore including Government of India share of ₹14,600 Crore (approx. ₹4800 Crores for ODF–individual house hold toilets [IHHL], urinals and community and public toilets [CT/PT]
- approx. ₹7400 crore for SWM
- ₹1800 crore approx for IEC, and
- ₹600 crore approx. for capacity building), and
- states hare of ₹4,874 crore.
- Balance funds to be generated through other sources.

6.15 Of the amount of ₹14,600 crore of Centre's share, ₹5037 crore released to state still date (including ₹2595 crore for ODF component, ₹1860 crore for Solid Waste Management, ₹462 crore for IEC and ₹124 crore for Capacity building)- representing 36% of total Mission allocation.

6.16 Progress made till date on various components are given below:

Sanitation

- ODF achievement:
  - Urban areas of two states – AP and Gujarat, and 1 UT–Chandigarh, certified as ODF, currently undergoing recertification.
  - Till date 1037 cities have self-declared themselves ODF, of which 834 have been certified as Open Defecation Free through a third party verification process. (Refer table below)
  - ODF certified cities include large and mega cities such as Greater Mumbai, Vishakhapatnam, Ahmedabad, Bhopal, Trichy, Mysuru, Kozhikode, etc.
  - Pace of ODF achievement expected to accelerate : by 2nd October 2017, all urban areas of MP, Telangana, Kerala, Chhatisgarh, Maharashtra, Jharkhand expected to become ODF-long before the end of the Mission period.
- Construction of toilets: Nearly 36 lakh individual house hold toilet sand 1.8 lakh community and public toilet seats constructed till date (refer tables below), and nearly 17 lakh IHHL and 0.80 lakh CT/PT are under construction.
- Multi-media campaign: titled “Asli Tarakki” is being run to discourage open defecation and motivates lumd wellers, especially men, to construct toilets at home and to use community toilets.
- Faecal Sludge and Septage Management (FSSM): National FSSM policy has been released on 28th February, 2017 in convergence with AMRUT. Till date eight states have adopted state level policy/guidelines in line with the National Policy on Faecal Sludge and Septage Management (FSSM)

6.17 Solid Waste Management Processing and Disposal - Under the Waste to Compost scheme, following achievements have been made:

- Till date, 47 cities have been tagged with Fertiliser companies
- Assessed capacity of compost that can be produced in India from municipal solid waste is 54 lakh MTPA. Current production is 13 lakh MTPA, from 145 compost plants currently functional in the country. Waste to Compost production has increased manifold within one year from 1.5 lakhs in March 2016 to 13.13 lakhs till date**.**
- Another 150 plants are under construction/upgradation/revival with combined capacity of 33 Lakh MTPA capacity. Refer table below for state-wise breakup of the under construction plants in the country.
- A list of Decentralized compost technologies and Suppliers has been developed by MoUD that are available on the Swachh Bharat Urban portal for ready

reference.

- A multi-media communication campaign on waste-to-compost has been launched and being run with Shri Amitabh Bachchan as the face of the campaign to promote production of compost from kitchen waste by RWAs, banquet halls, canteen set c, and encourage farmers, farm houses and nurseries to consume city compost.

6.18 Under the Waste to Energy, it has been furnished that assessed capacity of power that can be produced from municipal solid waste is 511 MW. Of this, 7 plants are currently operational, with a combined capacity of 88 MW, and another 53 plants coming up with capacity of 405.3 MW.

6.19 Regarding solid waste Management, collection and transportation, MoHUA has submitted the following:

- **Door to door collection:** Till date 100% door to door collection exists in 43,264 wards out of total 81,015 wards in the country
- **Procurement:** To facilitate procurement of Waste Management Equipment, DGS&D has notified Solid Waste Management linked equipment in DGS&D rate contracts, for over 150 items.
- **Model by-laws**: 8 States have notified user charges and bye-laws and 9 are in progress
- MoHUA has also prepared a document of model by-laws for cities to adopt
- **Source segregation**: On 5th June 2017, a pan-India source segregation campaign launched by MoUD, to segregate wet and dry waste in to blue and green bins, in line with the mandates of the revised MSW Rules 2016. It is expected that by 2nd October 2017 all 4041 ULBs would have adopted source segregation along-with transportation of the segregated waste in segregated manner.

C. Smart Cities Mission

6.20 The Smart Cities Mission was launched by the Hon'ble Prime Minister on 25th June 2015 with an objective to provide basic infrastructure through convergence with other schemes, apply 17 enabled solutions to infrastructure and services to inform them and to develop complete infrastructure of the city through area based development.

6.21 As per MoHUA, the Mission will cover 100 cities and its duration will be five years (FY2015-16 to FY2019- 20). The Mission will be operated as a Centrally Sponsored Scheme (CSS) and the Central Government proposes to give financial support to the Mission to the extent of ₹48,000 crore over five years i.e. on an average ₹100 crore per

city per year. An equal amount, on a matching basis, will have to be contributed by the State/ULB; therefore, nearly ₹1,00,000 crore of Government/ULB funds will be available for Smart Cities development. Targets and achievements of the Mission are given in the table below:

Year	Target	Achievement
2015-16	Extensive citizen engagement exercise for planning process to create the City Development Plan.	Smart Cities Mission was launched in June, 2015. Mission Guidelines were also released on this event. In Stage 1, based on the intra-state competition conducted by the States/UTs, potential Smart Cities were announced to participate in Stage 2 of the Challenge. For this, each potential Smart City prepared their Smart City Proposal (SCP) with extensive citizen consultations. Approx. 1.42 crore citizens participated in the process.
		20 Smart Cities selected in Round 1 on 28.01.2016.
	Selection of 20 Smart Cities.	
2016-17	Selection of 40 Smart Cities.	In May 2016, based on the All India Competition, 13 Smart Cities have been selected in fast track round. In Round 2, 27 more Smart Cities have been selected in September 2016.
2017-18	Selection of 40 Smart Cities.	In Round 3, 45 potential Smart Cities participated. Out of which, 30 cities have since been selected in June 2017. Remaining cities will have to upgrade their proposals and submit to MoUD.

6.22 Since the launch of the Mission (25.06.2015) and till date, total ₹9719.53 crore has been spent under Smart Cities Mission. Of which, ₹9718.20 crore has been released by Government of India to Cities and ₹1.33 crore has been spent from MoHUA's fund. The year wise allocation of funds and the expenditure are as under:-

(Amount ₹ in crore)

Financial Year (FY)	Funds provided by GoI	Expenditure
2015-16	1,496.20	1,469.38
2016-17	4,598.50	4,493.65
2017-18	3,989.50	3,756.50
Total	10,084.20	9,719.53

6.23 As per annual report of the CPCB (2015-16),

"As per the study conducted by Central Pollution Control Board (CPCB) in 60 major cities of India, it has been observed that around 4059 T/day of plastic waste is generated from these cities. The fraction of plastic waste in total Municipal Solid Waste (MSW) varies from 3.10% (Chandigarh) to 12.47% (Surat). Average plastic waste generation is around 6.92% of MSW. With extrapolation of the plastic waste generation data from 60 major cities, it is estimated that around 25,940 T/day of plastic waste is generated in India. As per the results of the study, out of total plastic waste, around 94% waste comprises of thermoplastic content, which is recyclable such as PET, LDPE, HDPE, PVC etc. and remaining 6% belongs to the family of thermoset and other categories of plastics such as SMC, FRP, multi-layered, thermocol etc., which is non-recyclable.

Environmental Issues on Plastic Waste Management (PWM):

Following are the major environmental issues generated due to plastic waste

• Manufacture, stock, sale, & use of substandard carrybags (<50µ).

• Littering of plastic waste is major environmental issues, it makes land infertile, choke the drains, on ingestion by cattle cause death, give ugly look of a city or town and also damage marine eco-system.

• Accumulation of Non-recyclable plastic waste such as multilayered laminated packaging, thermoset plastic like SMC, FRP etc.

• Open burning of plastic waste, specially thermoset plastic waste is major health and environmental issue, as it emits toxic gases.

• Leaching impact on soil, underground water etc. due to dumping (contain metals & phthalates)."

D. URBAN TRANSPORT

6.24 India's approx. 30 per cent population lives in urban areas. It is anticipated to increase to 40 per cent by 2021 and further to 843 Million by 2050. As a result of the drastic increase in population and economic activity, India has experienced a tremendous growth of motor vehicles from 52.37 million in 2000 to 121.63 million in 2011 (i.e. an average growth rate of 9% per year). Such rapid urbanization eventually leads rapid increase in private vehicles to fulfill the travel demand in absence of credible public transport system. Because of high number of private vehicle, traffic congestion on the road is increasing which leads to not only travel time uncertainty but also causes stress to the commuters, causes air pollution which results in various kinds of ailments and also prone to traffic accidents

6.25 In order to deal with the emerging problems, the Government of India formulated a National Urban Transport Policy in April, 2006. The objective of the policy is to ensure accessible, safe, affordable, quick, comfortable, reliable and sustainable mobility for all. The policy seeks to promote integrated land use and transport planning, greater use of public transport and non-motorized modes of travel, use of cleaner technologies. It offers Central Government's financial support for investments in public transport, infrastructure for greater use of non-motorized modes, as well as in the construction of parking facilities, including demonstrative pilot projects. It encourages capacity building at institutional and individual levels, innovative financing mechanisms, institutional coordination, association of the private sector and need for public awareness and cooperation.

6.26 To encourage public transport, the Central Government has taken up various projects such as financing of buses and Bus Rapid Transit Systems (BRTS) under Jawaharlal Nehru National Urban Renewal Mission (JnNURM), preparation of Urban Bus Specifications (UBS) to promote use of comfortable buses equipped with latest Intelligent Transport System (ITS) and technology, encouraging reforms in urban transport administration and management at both city and state level by requiring setting up of Urban Metropolitan Transport Authority (UMTA), Urban Transport Fund etc., organizing annual conference and exhibition on urban transport for knowledge sharing amongst experts and stakeholders, recognizing the exemplary achievements in the field of urban transport through awards, spearheading the Sustainable Urban

Transport Project (SUTP) to encourage sustainable transport systems and capacity building, financing of various traffic/transportation studies and surveys under the Scheme for Urban Transport Planning to encourage cities to better plan and manage their urban transport systems etc.

6.27 Besides these measures, the Ministry has been playing an active role in financing Metro Rail projects which transform the urban transport radically by providing a very comfortable, accessible and environment-friendly means of public transport. Metro Rail projects provide the network which carries the maximum number of riders in any city in minimum time and on schedule.

6.28 The fund allocation for the urban transport and the total expenditure during the last three years is given as under

(₹ in crore)

Year	Allocation of budget	Expenditure
2015-16	9306	9295
2016-17	15665	15326
2017-18	18000	13978

6.29 It has also been stated in a written note that MoHUA has been playing an active role in financing Metro Rail projects, which transform the urban transport radically by providing a very comfortable, accessible and environment-friendly means of public transport. Metro Rail projects provide the network, which carries the maximum number of riders in any city in minimum time and on schedule.

6.30 In a written submission to the Committee regarding expansion of Metro Rail projects across the country, MoHUA has informed as under :

> " At present, metro rail is being implemented in 13 cities of India. 515 km route length of metro rail line are already operational in Delhi, Bengaluru, Kolkata, Chennai, Jaipur, Kochi, Mumbai, Gurugram, Hyderabad and Lucknow. The Metro rail of approximately 664 km of route length are under construction and metro rail projects of route length of 536 km are under planning stage..."

CHAPTER - VII

NATIONAL MISSION FOR SUSTAINABLE AGRICULTURE

7.1 National Mission for Sustainable Agriculture (NMSA) is one of the eight Missions of NAPCC. According to the Ministry's written note, the strategies and programme of action (PoA) outlined in the Mission Document, that was accorded 'in principle' approval by PMCCC on 23 September, 2010, aim at promoting sustainable agriculture through seventeen deliverables focusing on ten key dimensions of Indian agriculture. During XII Five Year Plan, these measure were embedded and mainstreamed onto ongoing/proposed Missions/Programmes/Schemes of Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) through a process of restructuring and convergence.

Objective

7.2 As per DAC&FW, NMSA aims at transforming agriculture into an ecologically sustainable climate resilient production system by devising appropriate adaptation strategies for ensuring food security, equitable access to food resources, enhancing livelihood opportunities and contributing to economic stability at the national level. The objectives of NMSA programme are making agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific integrated/composite farming systems; soil and moisture conservation measures; comprehensive soil health management; efficient water management practices and mainstreaming rainfed technologies.

Mission Target

7.3 According to the DAC&FW, the strategy in original document had focused on promoting sustainable agriculture through a series of adaptation measures focusing on ten key dimensions encompassing Indian agriculture namely; 'Improved crop seeds, livestock and fish cultures', 'Water Use Efficiency', 'Pest Management', 'Improved Farm Practices', 'Nutrient Management', 'Agriculture insurance', 'Credit support', 'Markets', 'Access to information', and 'Livelihood diversification'. The programmatic NMSA only catered to key dimensions of Water use efficiency, nutrient management and livelihood

diversification through adoption of sustainable development pathway by progressively shifting to environment friendly technologies, adoption of energy efficient equipments, conservation of natural resources, integrated farming, etc. Since the funding support for implementing the programme of action outlined in the Mission Document was not made available, the targets were set for 10 quantifiable deliverables based on the approved programmatic interventions and resources available under the respective schemes of DAC&FW, DARE and DAHD&F.

Financial Allocation and Expenditure

7.4 According to DAC&FW, Cabinet Committee on Economic Affairs approved implementation of programmatic NMSA with an outlay of ₹9709 crore (period of implementation of NMSA: 2014-15 to 2016-17). However, during this period new targeted interventions like distribution of Soil Health Cards (SHCs) and Paramparagat Krishi Vikas Yojana (PKVY) were approved separately under Soil Health Management (SHM) component of NMSA programmatic interventions. Due to the introduction of these sub-components, the allocation of SHM increased to ₹1570.89 crore against the original approval of ₹700 crore for 5 years. Details of allocation of funds and their expenditures are given in the table below:

Allocation & Expenditure

Rs. In Crore

Sl	Scheme	2014-15		2015-16		2016-17		Total	
		Alloc	Rel	Alloc	Rel	Alloc	Rel	Alloc	Rel
1	RAD	305	304.86	198.2	198.11	205	204.83	708.2	707.8
2	OFWM	950	962.66	1550	1556.23	1992	1991.24	4492	4510.13
3	SHM	63.98	63.98	96	44.38	192.89	99.32	352.87	207.68
4	SHC	23.89	23.89	136.42	96.44	263.46	133.48	423.77	253.81
5	PKVY			335.05	226.18	459.2	152.18	794.25	378.36
6	SMAF					45	22.5	45	22.5
Total		**1342.87**	**1355.39**	**2315.67**	**2121.34**	**3157.55**	**2603.55**	**6816.09**	**6080.28**

RAD: Rainfed Area Development; OFWM: On Farm Water Management; SHM: Soil Health Management; SHC: Soil Health Card; PKVY: Paramparagat Krishi Vikas Yojana; SMAF: Sub-Mission on Agro-Forestry

Impact of Climate Change on Agriculture in India and Agriculture's Contribution in Climate Change

7.5 On being asked what is the assessment of the Ministry of Agriculture and Farmers Welfare of the effect of climate change on agriculture, DAC&FW, in a written reply, has furnished the following:

> "Climate change impact projections are worked out for major crops such as rice, wheat, maize, sorghum, mustard, soybean, potato, cotton and coconut. Summary of the projections of these crops as follows:
>
> Climate change is projected to reduce irrigated rice yield by ~4% in 2020 (2010-2039) and rainfed rice yield by 6%. Rainfed rice yields in India to reduce by ~6% in 2020 and <2.5% in 2050 (2041-2070) and 2080 (2070-2099) scenarios. With adaptation, however, irrigated rice yield to increase by about 17% and rainfed rice yield by about 20%…
>
> Wheat yield in India would reduce by 6 to 23% by 2050 scenario, if no adaptation is followed. Yield would reduce in areas with mean seasonal maximum and minimum temperatures more than 27 and 13ºC, respectively. Adjusting the time of sowing, suitable variety and input (fertilizer and irrigation) management may be a practical low-cost adaptation strategy to increase the yield (by >10%) in future climates… With every 1ºC increase in temperature, wheat yield is projected to lose 6 Mt…
>
> Maize yield in kharif season is projected to decrease by 18% but adaptation can increase the yield up to 21% in 2050 scenario … Earlier studies suggest a 2 to 5% decrease yield potential of wheat and maize for a temperature rise of 0.5 to 1.5ºC in India…
>
> Rainfed sorghum yield is projected to reduce by 2.5% in 2020 (2010-2039). Adaptation, however, can increase the productivity by 8% in 2020…
>
> Mustard yield is projected to reduce by ~2% in 2020 (2010-2039). Regions with mean seasonal temperature regimes above 25/10ºC to lose due to temperature rise. As climatically suitable period for mustard cultivation may reduce in future, short-duration (<130 days) cultivars with 63% pod filling period will become adaptable…
>
> Increase in soybean yield in the range of 8-13% under different future climate scenario (2030 to 2080) is projected. In case of rainfed groundnut, except in the

climate scenario of A1B[1] 2080 (-5%), in rest of the scenarios yield is projected to increase by 4-7%...

The potato crop duration in the Indo-Gangetic Plains is projected to decrease and yield is to reduce by ~2.5, ~6 and ~11% in 2020 (2010-2039), 2050 (2040-2069) and 2080 time periods, respectively. Change in planting time could be the most important adaptation option which may lead to yield gain by ~6% in 2020…

Cotton productivity in northern India may marginally decline due to climate change while in central and southern India, productivity may increase. However, at the national level, cotton productivity may not be affected…

Climate change is projected to increase coconut productivity in western coastal region, Kerala, parts of Tamil Nadu, Karnataka, and Maharashtra (provided current level of water and management is made available in future climates as well) and also in North-Eastern states, islands of Andaman and Nicobar and Lakshadweep while negative impacts are projected for Andhra Pradesh, Odisha, West Bengal, Gujarat and parts of Karnataka and Tamil Nadu. Productivity in India can be improved by 20% to almost double if all plantations in India are provided with location specific agronomic and genotype intervention in current climates…

Apple productivity is affected and its cultivation is shifted to higher latitudes to 2500 metres above mean sea level (mamsl) from 1250 mamsl in Himachal Pradesh…

Climate stresses such as heavy rainfall events damage horticultural crops. Flooding for 24 hour affects tomato with flowering period being sensitive. Similarly, onion bulb initiation stage is sensitive to flooding causing a 27 and 48% reduction in bulb size and yield, respectively…

Climate change is projected to affect the quality in terms of reduced concentration of grain protein (under low fertilizer input conditions), and some minerals like zinc and iron due to elevated CO_2…

Elevated CO_2 caused reduction in the concentration of protein, secondary metabolites while rise in temperature enhanced their concentration in pulse, several vegetable and fruit crops.

Global warming is likely to lead to a loss of 1.6Mt milk production by 2020 and 15Mt by 2050 if no adaptation is followed. The losses may be highest in UP

[1]A future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies and technological emphasis on balance across all sources (where balanced is defined as not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end-use technologies).

followed by Tamil Nadu, Rajasthan and West Bengal. Increased number of heat stress days and probable decline in availability of water may further impact animal productivity…

Rise in temperature caused latitudinal extension in abundance of oil sardine along the India cost. Marine fish availability has extended to deep waters and the spawning activity of *Nemipterus* spp. reduced in summer months and shifted towards cooler months…

Breeding season of India major carps extended from 110-120 days (Pre 1980-85) to 160-170 days, making it possible to breed them twice in a year at an interval ranging from 30-60 days…

Rise in temperature causes reduction in egg and meat production of poultry birds. The critical body temperature at which the poultry birds succumb to death is 45ºC which was observed at the shed temperature of 42ºC…

Climate change is projected to increase soil erosion, affect water availability and quality (IPCC, 2014)

Indian farmers have been adapting to climatic risks. A detailed household level analysis in a village indicated that the cost of adaptation and gains vary with type of climatic risk, type of agriculture and farm size. Strategies such as improved varieties, crop diversification, crop water and livestock management, value additions, etc. have led to farm resilience to climatic risks. Small and marginal farm (<4 acre) families cannot support themselves with agricultural income alone, however, with adaptation a self-sustaining agriculture could be achieved. Additional cost is not always required for adaptation (particularly in mid and large farm holdings) and rationalizing agricultural expenditure through scientific crop management is essential for adapting to climatic risks…

7.6 Regarding agriculture's contribution in climate change, DAC&FW, in a written reply, has submitted that following:

"Agriculture influences environmental changes through

- GHG emission from paddy and enteric fermentation
- Crop residue burning
- Indiscriminate application of pesticides and synthetic fertilizers

GHG emissions from India agriculture

During the period of 1970 to 2014, the GHG emissions from Indian agriculture have increased by about 80%. The increased use of fertilizers and other agri-inputs and the rise in population of livestock are the major drivers for this

increase in GHGs emissions. The relative contribution on Indian agriculture to the total GHGs emission from all the sectors of the country, however, has decreased from 33% in 1970 to 15% in 2014. A relatively faster growth and consequently higher emissions from the energy, industry and transport sectors vis-à-vis agricultural sector are responsible for the decrease in the relative contribution to GHGs from agriculture…

It was estimated that methane from India rice fields is about 3.3 million tonnes. Among the various rice ecosystems, the highest emission was from the irrigated continuously flooded rice (34%), followed by rainfed flood-prone rice and irrigated single aeration (18%). Rainfed drought-prone, deep water and irrigated multiple aerations rice ecosystems contributed 16%, 8% and 6% of methane, respectively…

The emission of nitrous oxide ranged from 0.5-2.0 kg/ha. Fertilizer was the largest source contributing about 75-80% to the total nitrous oxide emission from India agriculture…

Crop residue burning

to a report on crop residue burning (IARI, 2012), it is estimated that approximately 500-550Mt of crop residues are produced per year in the country, though another estimate puts it at 600-620Mt out of which is approximately 15.9% residue is burnt of farm… These crop residues are used for animal feeding, soil mulching, bio manure making, thatching for rural homes and fuel for and industrial use. Thus crop residues are of tremendous value to the farmers. However, a large portion of the residues is burnt on-farm primarily to clear the field for sowing of the succeeding crop. The problem of on-farm burning of crop residues is intensifying in recent years due to shortage of human labour, high cost of removing the crop residues by conventional methods and use of combines for harvesting of crops. The residues of rice, wheat, cotton, maize, millet, sugarcane, jute, rapeseed-mustard and groundnut are typically burnt on-farm across different states. The problem is more severe in the irrigated agriculture, particularly in the mechanized rice-wheat system of the northwest India (IARI, 2012). Burning of crop residues leads to release of soot particles and smoke causing human and animal health problems. It also leads to emission of GHGs namely, carbon dioxide, methane, and nitrous oxide, causing global warming; carbon monoxide; other hydrocarbons. One ton of rice straw on burning releases about 3kg particulate matter, 60kg CO, 1460kg CO_2 and 2kg SO_2… Rice straw contributed 40% of the total residue burnt followed by wheat straw (22%) and sugarcane trash (20%). It is estimated that burning of crop residues emits 8.57Mt of CO, 141.15Mt of CO_2, 0.037Mt of SOx, 0.23Mt of NOx, 0.12Mt of NH_3 and 1.46Mt of NMVOC, 0.65Mt of NMHC, 1.21 Mt of particulate matter …

These gases are of major concern for their global impact and may lead to increase in the levels of aerosols, acid deposition, and increase in tropospheric ozone."

Indiscriminate use of pesticides

It is one of the main causes of environmental pollution including air pollution, soil pollution and water pollution. Even though per hectare consumption of pesticides in India is amongst the lowest in the world and currently stands at 0.6 kg/ha (FICCI, 2016), many of the pesticides are applied without following the minimal safety measures leading to health risks, soil, water and air pollution. All these have been influencing the natural flora, fauna, beneficial insects, predators as well as the human beings. Further, the usage of pesticides is highly concentrated in irrigated cultivation zones of the country.

7.7 The Ministry in a written reply has furnished the indigenous model for prediction of green house gas emissions by the agriculture sector as under:

"The InfoCrop, a process based simulation model, indigenously developed at the Centre for Environment Science and Climate Resilient Agriculture (CESCRA; earlier Division of Environmental Sciences, IARI), is capable of simulating the GHG emissions from agricultural fields. InfoCrop v1 was first released in 2004 and the updated and improved InfoCrop v2 and v2.1 were released in 2014 and 2015, respectively. InfoCrop v2.1 can be freely downloaded from www.iari.res.in by the users. As of now, over 2000 users in 46 countries have downloaded the model for use. It is a generic dynamic simulation crop growth model that can simulate the effects of weather, soil, agronomic managements (including planting dates, nitrogen, residue and irrigation) and major pests on crop growth and yield as well as emission of nitrous oxide, methane and CO_2 along with global warming potential of the emissions… of 11 crops (rice, wheat, maize, sorghum, millet, potato. Cotton, groundnut, mustard, pigeon pea, chickpea and soybean …

InfoCrop is different from other simulation models such as DSSAT (developed in USA), in addition to the growth and yield of different crops InfoCrop is capable of simulating GHG emissions, pests and disease, Model is well calibrated to Indian varieties, tested for simulating crop performance in India conditions and has the soil database for all 1457 soils for districts of India.

Adaptation Activities and their Outcomes/Outputs

7.8 Mitigation activities undertaken and their outcomes/outputs are outlined in the table below:

Mission deliverables & Achievements

	Deliverables/Activities	Target (2012- 17)	Achiv. (2012- 17)
NMSA programmatic Interventions	Area under Organic Farming (lakh ha)	14.74	18.70
	Production of Biofertilizer (lakh MT)	Demand Based	3.96
	Precision Irrigation (lakh ha)	32.13	28.46
Other interventions re-aligned with available resources/ Schemes of DAC&FW/ ICAR/ DADF	SRI/DSR against conventional rice cultivation (lakh ha)	10.71	8.05
	Diversification to less water consuming crop/cropping system (lakh ha)	9.05	2.637
	Additional Area under Plantation in Arable land (lakh ha)	7.59	8.01
	Climate Resilient Varieties (CRV) Identified/Released (No)	461	450
	a) Identification of genotypes of crops with enhanced CO2 fixation potential and less water consumption & Nutrients (No.)	37	75
	b) Climate Resilient genotypes with greater adaption to drought, flood, salinity & high temp (No.)	35	73
	Coverage of Milch Animal under Ration Balancing Programe (lakh No.)	23.8	24.15
	Establishment of bypass protein feed making unit (Capacity of 50 MT per day) (No.)	12	5

A. Area Under Organic Farming

7.7 Organic farming plays significant roles in reduction of greenhouse gases, sequestration of CO_2 in soil. Synthetic nitrogenous fertilizers are major contributors of N_2O, however, organic farming is self-sufficient in nitrogen. Organic farming restricts on use of synthetic fertilizers considerably, thereby reduces the concentration of easily available mineral nitrogen in soil and thus N_2O emission. Organic farming practices may decrease greenhouse gas emission as CO_2 emission in organically managed fields are 48-66% lower than conventional farming systems. The main effects of organic agriculture that are responsible for this difference are the maintenance and increase of soil fertility by the use of farmyard manure; the omission of synthetic fertilizers and synthetic pesticides; the lower use of high energy consuming feedstuff.

7.8 Under NMSA, during 2012-13 to 2016-17, 18.70 lakh ha area has been brought under the organic farming.

7.9 In a written reply regarding organic farming, DAC&FW has furnished the following:

> "Under PKVY, the financial assistance of ₹10,000 per acre (or ₹25,000 per ha) is given to farmers to support them for moving from inorganic to organic form of

cultivation over a period of 3 years. It is **not** a subsidy in the nature of that offered on chemical fertilizers. The assistance under PKVY covers the following:

(a) Mobilization of farmers/local people to form cluster.
(b) Participatory Guarantee System (PGS-India) Certification and Quality Control
(c) Adoption of Organic seeds, Organic inputs, Biological nitrogen, etc.
(d) Integrated Manure Management,
(e) Custom Hiring Centre Charges,
(f) Labeling, Branding and Transportation

In case of chemical fertilizers subsidy is granted to farmers to make available chemical fertilizers at affordable price.

Hence, in order to incentivize farmers taking to organic cultivation practices, it would be useful to offer subsidy on organic imputs, like bio-fertilizers, organic compost, as also bio-pesticides and bio-agents on the line of subsidy for chemical fertilizers. The Government in the Department of Fertilizers has however been encouraging use of city compost by providing Market Development Assistance of ₹1500/metric tonne."

7.10 When asked how long a chemical-based farming takes to become fully organic, the Ministry in a written reply has submitted as under:

"It takes 3 years for conversion of land under long duration of chemical based agriculture to organic status. Accordingly, the scheme guidelines under PKVY provide financial assistance. Under National Programme for Organic Production (NPOP) and Participatory Guarantee Scheme (PGS), it takes three years to get certification for organic farming provided the norms prescribed are followed fully. NPOP standards are adopted, when the organic product is to be exported. PGS is a simpler and hassle free system, that is being promoted by DAC&FW to enable farmers to adopt certain standards and PGS certified products are accepted in the domestic market."

7.11 The Ministry has also furnished the state-wise area covered under PKVY for organic farming which is given at **Appendix – VIII**.

7.12 On being asked what is the improvement due to conversion to organic farming from chemical-based farming in terms of soil health and productivity, the Ministry in a written reply has stated as under:

"As regards productivity, three broad situations as under occur:

(i) In low productivity areas: yields/ha increase with good organic farming practices. With organic farming practices, the soil health starts to benefit in terms of organic carbon, which is essential for a good soil structure. It is this that determines soil aeration and water percolation. Apart from this, the general fertility and health status improve and problem like soil toxicity, etc. gets corrected.

(ii) In moderate productivity areas: yield/ha will equal, and even improve over the years with good farming practices.

(iii) In high productivity areas: yields generally dip below the existing, since high productivity of crops in India is seen in irrigated areas, where hybrid and HYVs are sown, and these are responsive to intensive use of fertilizers and water. However, the dip in productivity can be made up in terms of monetary value, as organic products fetch premium price in the market."

B. Production of Biofertilizers

7.13 Use of biofertilizers reduces dependence on synthetic chemical fertilizers. These may supplement about 25% demand of chemical fertilizer for a specific crop. N_2O gas is mainly emitted due to use of nitrogenous fertilizers. Increased production of biofertilizers has provided supplementary nutrient source in the form of biofertilizers which are climate friendly, sustainable and cost-effective inputs. Production of biofertilizers is damand based and during 2012-17, annual production of biofertilizers has increased up to 3.96 lakh MT.

C. Precision Irrigation

7.14 Micro Irrigation System (MIS) delivers water directly to the root zone of crops resulting in improved water use efficiency through reduced loss of water during irrigation and conveyance with a savings in power consumption at the end. During 2012-17, the coverage under MIS is 28.46 lakh ha.

7.15 Micro irrigation helps in reduction in irrigation cost by about 32% and electricity consumption by about 31%. It saves fertilizer usage by about 28%. The average productivity of fruits and vegetables has been observed to increase by nearly 42% and

52% respectively. Emission reduction by Micro Irrigation from flood irrigation is about 0.748 tonnes of CO_2/ha.

D. System of Rice Intensification (SRI)/Direct Seeded Rice (DSR) against conventional rice cultivation

7.16 SRI method of rice cultivation consisting of transplanting 8-12 days old seedling at wider spacing of 25cm×25cm was found superior to traditional transplanted paddy system, standing water where the field is maintained at saturation thus a savings of water use. The technology is being promoted under National Food Security Mission (NFSM). During 2012-17 the coverage has been reported under SRI is 7.42 lakh ha.

7.17 SRI methods help increase yields by over 30%, while using 40% less water than conventional methods. Besides, anaerobic decomposition of organic material in flooded rice fields produces methane (CH_4), which escapes to the atmosphere primarily by diffusive transport through the rice plants during the growing season is reduced in case of SRI/DSR.

E. Diversification to less water consuming crop/cropping pattern

7.18 Crop diversification is another adaptation measure that has been identified as a potential farm-level response to climatic variability and change. Initiated by the government for diverting the paddy area to other crops such as cereals, pulses, agro-forestry etc. the programme is gaining momentum. During 2012-17, the coverage under crop diversification is about 2.6 lakh ha. This has led to reduction in water use.

7.19 As per a report coming in the media:

> "India supports 15 percent of the world's population, but has only 4 percent of the world's water resources. World Bank data shows that only 35 percent of India's agricultural land is irrigated. This means that a huge 65 percent of farming depends totally on rain.
>
> Successive Indian governments have done little to conserve water for off-season use. Even after constructing 4,525 large and small dams, the country has managed to create per capita storage of only 213 cubic meters — compared to 6,103 cubic m per capita in Russia, 4,733 in Australia, 1,964 in the United States, and 1,111 in China.

India's water crisis stems from a thorny mix of economic, geographic, and political factors. For one thing, it is highly dependent on a few major river systems, especially the Ganges and its tributaries, for its water supply. But India also uses almost twice the amount of water to grow crops as compared to China and United States. There are two main reasons for this. First, power subsidies for agriculture have played a major role in the decline of water levels in India.... Farmers drawn to the region by government incentives have begun cultivating sugarcane, a water-intensive crop that is ill-suited to Marathwada's semi-arid climate. Sugarcane consumes about 22.5 million liters of water per hectare during its 14-month long growing cycle compared to just 4 million liters over four months for chickpeas, commonly grown in India and called gram locally.

Growing sugarcane in drought-prone areas is a recipe for water famine. Yet, the land area under sugarcane cultivation in Maharashtra has gone up from 167,000 hectares in 1970-71 to 1,022,000 ha in 2011-12. Maharashtra is India's second-biggest producer of this water-intensive crop, despite being one of the country's drier states. Sugarcane now uses about 70 percent of Marathwada's irrigation water despite accounting for 4 percent of cultivated land.

F. Additional area under plantation in arable land

7.20 The horticulture sector encompasses a wide range of crops such as fruits, vegetables, flowers, spices, nuts, etc. of which the fruit crops produce relatively higher biomass and retained in the field for a relatively longer period and thus sequesters carbon both above and below ground parts.

7.21 Fruit tree plantation absorbs about 1 tonne of Carbon/ha annually. During 2012-17 alone, area of 8.01 lakh ha has been brought under plantation in arable land which has significantly contributed towards CO_2 sequestration in soils.

G. Climate Resilient Varieties

7.22 The development and identification of climate resilient crop varieties, with enhanced tolerance to heat, drought, flooding, chilling and salinity stresses are essential in order to sustain and improve crop yields to cope with the challenges of climate change. It is essential to bridge the yield gaps, enhance the productivity and profitability, minimize risk and improve the livelihoods of millions of people dependent on agriculture.

7.23 Under National Innovation for Climate Resilient Agriculture (NICRA), during 2012-17 about 450 climate resilient varieties have been identified/released. Climate

resilient crop varieties along with other suitable adaptation and mitigation strategies will help to overcome the adverse impact of climate change by lowering the yield losses under stress condition.

Identification of genotypes of crops with enhanced CO_2 fixation potential and less water and nutrient consumption, Climate Resilient Genotypes with greater adaptation to drought, flood, salinity and high temperature

7.24 The improved genetic resources could serve resilient genotypes for enhanced CO_2 fixation potential in the soil which will increase the soil organic carbon, thus increasing the soil fertility. Besides, these may have greater adaptation potential against climatic changes/adverse climatic conditions.

7.25 Under NICRA, during 2012-17, about 75 genotypes of crop with enhanced CO_2 fixation potential have been identified. Additionally, 73 genotypes with greater adaptation to drought, flood, salinity and high temperature have been identified. These genotypes will contribute towards achieving India's NDC for creation of additional carbon sink of 2.5 to 3.5 billion tonnes of CO_2 eq. besides, providing better productivity even in the adverse climatic events. In a written reply, DAC&FW has added the following:

> "National Food Security Mission (NFSM) aims at increasing foodgrain production through area expansion and productivity enhancement. Under NFSM programme, State Governments are advised to use latest varieties of hybrids/HYVs of less than 10 years old for rice, wheat, coarse cereals (nutria-cereals) and less that 15 years old for pulses. Under NFSM-Rice, state area also requested to use stress tolerant varieties for problematic soils..."

7.26 Pradhan Mantri Fasal Beema Yojana was launched in 2016. As per a media report :

> "PMFBY is yield-based insurance that uses crop-cutting experiments (CCEs) to determine the yield lost by farmers due to natural catastrophes and adverse weather conditions. The yield obtained through the CCE's determine the payout made by the insurance firm to the farmer. The new scheme looks to improve on the existing schemes by removing caps on the premiums and making use of modern technology. However, there are several problems that exist with the PMFBY such as the delay in crop cutting experiments and its associated high costs, delayed/non-payment of insurance claims to farmers and lack of transparency. As a result, farmers lose interest in the crop insurance schemes.

Another problem that faces crop insurance schemes in India is coverage. The new scheme reveals that overall area insured has decreased over the last 2 years (from 53.7 million hectare in 2015-16 and 57.2 million hectare in 2016-17 to 47.5 million hectare in 2017-18). This is less than 24% of the gross cropped area (against a target of 40%) as compared to 89% in the US and 69% in China.

A promising insurance product that mitigates the risks associated with yield based crop insurance is weather-indexed insurance. It is a financial instrument consisting of contingent claims contracts held by farmers. The payouts are determined by a combination of objective weather parameters (rainfall, temperature etc.) that are highly correlated to crop yields and are automatically triggered once the weather parameters reach a pre-specified level. This results in timely payouts farmers and low administrative costs as there is no need for field-level damage assessment. As the weather index is publicly available & transparent, it allows the insurance companies to transfer a part of their risk to international markets.

However, for weather-indexed insurance to be viable, it is necessary to mitigate basis risk. Basis risk is the possibility that the insurance may not pay out even though the customer has experienced a loss or the insurance pays out even though no loss occurs. In order to address basis risk, it is pertinent to increase the density of automatic weather stations (AWS) and rainfall data loggers in India. At present, there are only 706 AWS installed by the government across the country.

According to a working paper by the Indian Council for Research on International Economic Relations(ICRIER), the entire country could be covered by installing an additional 33,000 AWS and 170,000 rainfall data loggers. This would cost the government anywhere between Rs 300 crore and Rs 1,400 crore. As weather indices are lead indicators, the government can ensure timely payments by linking land records of farmers with their Aadhaar numbers and bank accounts. Also, the unit area covered under the insurance scheme should be the village for effective targeting and minimisation of basis risk. At present, the only state government to have defined the village as the unit area under insurance is Odisha.

Despite the advantages of weather-indexed insurance, coverage under WBICS continues to remain an issue and the number of farmers insured has declined from 11.25 million in 2014-15 to a little over 2.1 million in 2016-17..."

7.27 Patenting of seeds is a major contributor to farm distress. An expert, in this regard wrote as under:

" Corporations prevent seed savings through patents and by engineering seeds with non-renewable traits. As a result, poor peasants have to buy new seeds for every planting season and what was traditionally a free resource, available by putting aside a small portion of the crop, becomes a commodity. This new expense increases poverty and leads to indebtness.

The shift from saved seed to corporate monopoly of the seed supply also represents a shift from biodiversity to monoculture in agriculture. The district of Warangal in Andhra Pradesh used to grow diverse legumes, millets, and oilseeds. Now the imposition of cotton monocultures has led to the loss of the wealth of farmer's breeding and nature's evolution.

Monocultures and uniformity increase the risk of crop failure, as diverse seeds adapted to diverse to eco-systems are replaced by the rushed introduction of uniform and often untested seeds into the market. When Monsanto first introduced Bt Cotton in 2002, the farmers lost 1 billion rupees due to crop failure. Instead of 1,500 kilos per acre as promised by the company, the harvest was as low as 200 kilos per acre. Instead of incomes of 10,000 rupees an acre, farmers ran into losses of 6,400 rupees an acre. In the state of Bihar, when farm-saved corn seed was displaced by Monsanto's hybrid corn, the entire crop failed, creating 4 billion rupees in losses and increased poverty for desperately poor farmers. Poor peasants of the South cannot survive seed monopolies. The crisis of suicides shows how the survival of small farmers is incompatible with the seed monopolies of global corporations."

7.28 The Ministry has also submitted details of improved varieties of food crops developed by Indian farmers of scientists of ICAR/IARI which are resilient to the various effects of climate change in **Appendix - IX**.

Zero Budget Natural Farming

7.29 As per media reports, NITI Aayog is urging all States to work towards giving practical shape to the Zero Budget Natural Farming (ZBNF) as being done in Himachal Pradesh and Andhra Pradesh and has agreed to provide assistance for the same. Under ZBNF, neither fertilizer nor pesticide is used and only 10 per cent of water is to be used for irrigation as compared to traditional farming technique. Farmers use only local seeds and produce their own seeds. States can promote ZBNF under the two farm sector schemes- Paramparagat Krishi Vikas Yojana and Rashtriya Krishi Vikas Yojana. It was also stated that "50 lakh farmers are working on zero budget farming in different states, and that not only it has the potential for India but it also has global potential. It has also been reported that, "In pursuing the States to adopt ZBNF, the apex agency is seized of the fact that the zero-budget technique has resulted in an increase in the yields of crops like cotton by 11 per cent, paddy by 12 per cent, groundnut 23 per cent, and chilli 34 per cent at less than half the cost of cultivation. Pioneered by Subhash Palekar, an innovative farmer from Maharashtra, the technique has been tested across Andhra

Pradesh where over 163,000 farmers on some 150,000 acres of farmlands spread across six agro-climatic zones have successfully demonstrated that farming without chemicals is a profitable possibility. ZBNF has been in vogue on a small scale across several farms in the country for over a decade now, but the AP Government gave it the desired fillip. The technique replaces fertilisers and pesticides with concoctions of cow dung, cow urine, jaggery and pulse flour, and ensure perfect soil conditions for plant growth. It does so by keeping the top soil covered with crop residues to increase water retention while *beejamrutham*, coating of seeds with cow dung and urine; *jeevamrutham*, concoction made of dung, urine, jaggery and pulse flour to multiply soil microbes; and *kashayams*, concoction with lilac and chillies to protect plants from pests, do the rest."

Crop Residue Burning

7.30 The issue of pollution caused in the national capital as a result of crop residue burning was deliberated upon in the Economic Survey (2017-18) as stated under:

> "...**Crop residue, biomass burning (26-29 per cent)**. Some 35 million tons of rice-paddy stubble in 10 million ha, in 3 adjoining states (Punjab, Haryana and Western Uttar Pradesh), burnt in late October, and whose plumes drift eastward, and seasonal load from other sources, including fire-cracker burning during Diwali (banned in 2017 by the Supreme Court, which saw a notable decrease as a contributory factor). Crop residue burning is a practice that came with combine harvesters — machines that harvest, thresh and clean the separated grain at one go. It takes barely an hour and ` 1,000-1,500 to cover an acre of paddy using combines. The same job through traditional sickle-harvesting and manual threshing-cum-cleaning requires about 10 men working a full day, and costing ` 4,500 or upwards. But combine-harvesting also leaves behind 14-15- inch long stalks in the fields that farmers have to, then, find a way to get rid of. This is to reduce the cost of disposing off the stubble. According to a 2014 study by the Indian Agricultural Research Institute (IARI), in 2008-09 the country generated 620 million tonnes of crop residue, of which around 16 per cent was burnt on farms. Of which, 60 per cent was paddy straw, whereas wheat accounted for just 22 per cent. As per estimates, Punjab alone produces 19-20 million tonnes of paddy straw and about 20 million tonnes of wheat straw. About 85-90 per cent of this paddy straw is burnt in the field, and, as the satellite images show, wheat straw is also increasingly being burnt in recent years. IARI report also shows that the main reasons for burning crop residues in field include unavailability of labour, high cost in removing the residues and use of combines in rice-wheat cropping system especially in the Indo-Gangetic plains (IGP). Primary crop types whose residues are typically burned include rice, wheat, cotton, maize, millet, sugarcane, jute, rapeseedmustard and groundnut. Farmers

in northwest India dispose a large part of rice straw by burning in situ. Wheat crop residue burning is emerging as a major issue in districts where irrigation is not a concern, cropping patterns are intense and mechanised farming options are abundant. Increased irrigation network has resulted in acreage and thus proportionate increase in residue burnings as well. The usage of combine harvesting machines appear to be an important reason because it only reaps the grains, leaving stalks or stubble of around 40 cm. Removing the stubble manually or by using specialised machines to do the job is costly. For every 0.4 ha of wheat crop, the cost of renting a combine harvester is just ` 800. Once the machine has harvested, the cost of getting the stubble removed is ` 3,500/ha. So the value of fodder is discounted because it is more economic for the farmers to just burn by using one Rupee match box and clear the fields.

On December 10, 2015, the National Green Tribunal (NGT) banned crop residue burning in states of Rajasthan, Uttar Pradesh, Haryana and Punjab. Parts of these states constitute the National Capital Territory. Earlier in 2014, the Union government had released the National Policy for Management of Crop Residue, which NGT directed the states to implement. Under this policy each state needs to have an action plan to stop residue burning by involving people at different levels—from communities to panchayats to state governments. It also calls for a mechanism to alert to cases of crop burning. Moreover, crop residue burning is punishable under the Air (Prevention and Control of Pollution) Act, 1981."

CHAPTER - VIII

NATIONAL MISSION FOR SUSTAINING THE HIMALAYAN ECOSYSTEM

8.1 The Himalayan Region is a complex and interrelated ecology of planet earth. Its total area is 4.3 million sq km (approx.). It has one of the longest, loftiest and dynamic mountain chains on earth, spreading over a length of 2500km covering eight countries, namely Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. It has the largest bodies of ice outside polar caps measuring 3735 sq km providing eternal ice and snow (3250 cubic km fresh water). Himalayan glaciers constitute 17% of global mountain area. Nine large Asian river systems originate from the Himalayan Region namely, the Indus, Ganges, Brahmaputra, Irrawaddy, Salween, Mekong, Tarim, Yangtse and Yellow River. It is the most populated mountain system in the world having 1.5 billion people who depend on the Himalayas for water, food and energy.

The Indian Himalayan Region

8.2 The Indian Himalayan Region (IHR) extends over an area of 594,427 sq.km (18.15% of India) covering ten states fully and two states partially. The region supports 6.36% of India's population (2011 census). It is also considered a regulator of Indian monsoon. The region contributes 63% to India's water budget with Brahmaputra basin contributing 34%, Ganga basin 25%, and Indus basin 4% to the total water. It has become all the more important to keep the Himalayan Ecosystem intact and sustainable for achieving India's climate change mitigation goals as well as for India's water, food and energy security.

The Mission

8.3 According to Department of Science and Technology (DST), Ministry of Science and Technology, National Mission for Sustaining the Himalayan Ecosystem (NMSHE) has been implemented with the primary objective to build Science and Technology (S&T) Capacity to address sustenance of Himalayan Ecosystem. The Mission aims to understand the complex processes affecting Himalayan Ecosystem and evolve suitable management and policy measures for sustaining and safeguarding the Himalayan Ecosystem. The crucial and primary objective of the mission is to develop a sustainable national capacity to continuously assess the health status of the Himalayan

ecosystem, enable policy bodies in their policy-formulation functions and assist states in the IHR with their implementation of actions selected for sustainable development to sustain ecological resilience and ensure the continued provisions of key ecosystem services in the Himalayas.

Allocation of Funds and the Expenditure

8.4 As per the written note of DST, details of allocation of funds and expenditure provided for NMSHE are given below:

	Total Allocation (in Cr of Indian Rupees)			**Actual Expenditure (In Cr of Indian Rupees)**			**%age utilization**
Budget Head / FY	**Capital**	**Gen.**	**Total**	**Cap.**	**Gen.**	**Total**	
2011-12	3.74	4.10	7.84	3.74	4.10	7.84	100
2012-13	13.20	6.21	19.41	13.2	6.21	19.41	100
2013-14	3.30	5.69	8.99	3.30	5.69	8.99	100
2014-15	12.0	12.0	24.0	11.85	11.89	23.74	99%
2015-16	15.0	20.0	35.0	4.77	11.12	15.89	45%
2016-17	30.0	25.0	55.0	19.99	23.51	43.47	79%
Total	**77.24**	**73.0**	**150.24**	**56.85**	**62.52**	**119.37**	**79.5%**
2017-18 (till 05.07.2017)	23.5	28.0	51.5	6.57	10.80	17.37	34%

Details of Activities undertaken so far and their Outcomes/Outputs

8.5 Details of activities undertaken so far and their outcomes are discussed in the succeeding paras.

8.6 Centre for Himalayan Glaciology (CHG) at Wadia Institute of Himalayan Geology, Dehradun: CHG is an autonomous institute of DST, with a cost of about ₹24 crore with

the broad objective of institutionalizing glaciological research in the country to provide holistic approach to Himalayan glaciology research.The Centre has 18 employees which include 8 Scientists, 1 Technical officer, 2 Jr. Technical officers, 2 Technical Assistants, and 5 Research Scholars. All these personnel have been trained in various disciplines of their work.

8.7 As provided by DST, some of the key outcomes of the Centre include the following:

a) Installation of six Automatic Weather Stations (AWS) in Chorabari, Dokriani and Pindari glacier catchment in the Upper Ganga Valley for real time weather data collection;. installation of three Aethlometers in the Bhagirathi Valley to monitor black carbon and aerosols; establishment of Laser Isotope Laboratory to analyse stable isotopes of oxygen and carbon in water and establishment of Remote Sensing and GIS Lab.

b) Monitoring of 8 glaciers namely Gangotri and Dokriani in Bhagirathi River basin, Chorabari and Companion in Mandakini River basin, Dunagiri and Bagni in Dhauliganga River basin and Pindari & Kafni in Pindar River basin in Uttarakhand region of Central Himalaya.

c) Centre has carried out a number of studies in respect of above glaciers and brought out reports and research papers. A total of 47 research papers have been published (37 in peer-reviewed journals and 10 in non-SCI journals) with a total impact factor of 70.

d) 3 students have been awarded Ph.D. Another 6 Research students have been recently enrolled for Ph.D.

e) Several workshops and brainstorming sessions were organised by the Centre wherein results from the studies carried out by the Centre were presented and discussed with experts and scientists.

8.8 Thematic Task Forces: As part of NMSHE deliverables, DST has set up 6 Thematic Task forces anchored around lead institutions working in the areas of Himalayan ecosystem. The Task Forces scientifically support the NMSHE objectives to develop in a time bound manner a sustainable national capacity to continuously assess the health status of the Himalayan ecosystem and enable policy bodies in their policy formulation functions. These Task Forces are leading research institutions working in specific ecosystem areas related to Himalayas. The Task Forces has engaged more than 100 research teams so far from more than 60 research and academic institutions spread across the IHR along with the state governments of the 12 Himalayan states.

8.9 Table below gives names of lead institutions along with broad themes on which Task Forces have to carry out research.

1	Wadia Institute of Himalayan Geology (WIHG), Dehradun	Natural & geological wealth
2	National Institute of Hydrology (NIH), Roorkee;	Water, ice. Snow, including glaciers
3	GB Pant National Institute of Himalayan Environment and Sustainable Development (GBNIHESD) Dehradun	Forest resources & plant biodiversity
4	Wildlife Institute of India (WII), Dehradun	Micro flora & fauna, wildlife & animal population
5	Jawaharlal Nehru University (JNU)	Traditional Knowledge Systems
6	institutions of Indian Council of Agriculture Research (ICAR)	Himalayan Agriculture

8.10 All the 6 task Forces have been given the task to undertake following technical work elements:

(a) Establishing database
(b) Designing monitoring systems
(c) Modeling and simulation
(d) Vulnerability assessment
(e) Adaptation policy research
(f) Pilot studies for revalidation

8.11 State CC Cells on NMSHE:DST has set up State CC Centres/Cells in the following 11 out of total 12 Himalayan States.

S. No.	**Name of State**

1	J&K
2	Himachal Pradesh
3	Uttarakhand
4	Arunachal Pradesh
5	Nagaland
6	Manipur
7	Mizoram
8	Meghalaya
9	Sikkim
10	Tripura
11	West Bengal

8.12 Inter-University Consortium on "**The Himalayan Cryosphere: Science, and Society":**Four Indian Universities namelyJawaharlal Nehru University, New Delhi; University of Kashmir, Srinagar J & K; University of Jammu, J & K and Sikkim Central University, Gangtok, Sikkim formed a consortium namely Inter-University Consortium on Cryosphere and Climate Change (IUCCCC) to look into Cryosphere-Societal interactions, within the framework of integrated science and social-science research. DST, in a written reply has furnished the details of activities undertaken by IUCCCC as given below:

Sl. No.	**Name of Institute**	**Progress of work/outcomes**
1	Jawaharlal Nehru University (JNU)-New Delhi	• A Research station has been setup near the selected benchmark glacier (Menthosa). The measurements of the snouts of Menthosa Glacier from 1965 to 2017 shows temporal and spatial variations in the rates of retreat varying from 5-6m/year • The glacier inventory has been continuously updated by taking into account the accelerated glacial dynamics over the last few decades. In addition, accuracy assessment existing

		glacier inventories i.e. RGIv5, ICIMOD, GCI and GSI was carried out to identify the gaps and their usability for the Indian glacier research. • Published 4 research papers
2	University of Jammu - J&K	• The geomorphological study of benchmark glaciers, namely Machoi, Thajwas and DurungDrung is being done. It was mentioned that few impediments were faced due to the change of the PI and now the work is progressing well. • Published 3 research papers
3	University of Kashmir-J&K	• Detailed glacio-geomorphological mapping and fluctuations in glacier geometry of benchmark glaciers including Hoksar, Thajwas, Kolahoi, Machoi and Wakhalbal glaciers has been carried out. • The assessment of Black carbon (BC) in snow and glaciers shows highest concentration at Srinagar. This aspect to be taken up separately for in-depth study. • Published 9 research papers.
4	University of Sikkim-Sikkim	• Automatic weather station, a (2) pre-fabricated research hut and (3) a hydrological site has been established • The glacier ice samples were collected form Changmekhang, (CKG) glacier and ChangmeKhangpu glacier (CK) glacier of North Sikkim, India and analyzed by both culture independent method (metagenomics and Phospholipids fatty acid analysis) and culture dependent method (Isolation of bacteria in different media) and physiochemical parameters by ICP-MS (Inductively coupled plasma mass spectrometry).

8.13 When asked to shed some light on the Indo-Swiss Capacity Building Programme in glaciology and the activities undertaken and the outcome on the ground about this Programme, DST, in a written reply, has furnished as under:

> "Within the overall framework of S&T agreement of 10th November 2003 between Government of India and Government of Switzerland an Indo-Swiss Joint Committee for Scientific and Technological Cooperation was established by the two governments. In the first meeting of this joint committee held in Bern, Switzerland on 23rd September 2011, it was decided to develop a scientific cooperation between the two countries in Glaciology and related areas. The first phase of Indo-Swiss programme was launched in the year 2013 which continued

until December 2015 wherein several rounds of training programmes with India and Swiss resource person were organized. A total of 55 young scientists were trained in the field of glaciology and related areas. In addition, Swiss agency has also been providing support for undertaking vulnerability and risk assessment, stakeholder training and public awareness programme at the State CC Cells. The second phase of the cooperation began in January 2016."

8.14 When asked upto what extent the Himalayan glaciers are in recession. MoEF&CC in a written reply has stated as under:

"The Himalaya contains the world's third largest glacier system after Antarctica and Greenland, There are about 9575 glaciers in the Himalaya which abound the world's highest mountain system. Owing to remote location of the Himalaya, in-situ measurements/study is not feasible for every glacier, but a long-term glacier observation of few representative glaciers on annual basis provide great input to estimate ice volume loss and glacier runoff variability at a regional level to enable the scientific community to understand the process of glacial dynamics and provide proper scientific rationale to the policy makers. It is well known that glaciers in the IHR have been retreating since the earliest recording began in the 19th century. Majority of the glaciers in the region are passing through a phase of recession similar to the glaciers in other parts of the world. However, the rates or recession and their mass balance in different climatic zones of the Himalayan region are found to have year to year variability.

The Centre for Glaciology (CFG) at Wadia Institute of Himalayan Geology (WIHG), Dehradun has been carrying out studies on observed changes in glaciers in the IHR using the ground monitoring and remote sensing techniques. The observations reveal that Dokriani Glacier retreated at an annual rate of 16.5 m during 1962 to1991, 17.8m from 1991 to 20000. 15.75m for the periods 2000-2007 and 18.5m during the period between 2007 and 2015. Conversely, Chorabari Glacier retreated 6.4m per year during 1962 to 2003 and 9.3m per year from 2003 to 2014.

CFG, WIHG has also carried out satellite remote sensing based studies on about 80 glaciers in Garhwal Himalaya which suggest that glacier area decreased from 599±15.6km2 (1968) to 572±18.0 km2 (2006), a total loss of 4.6±2.8%. However, glaciers in the Alaknanda and upper Bhagirathi basins lost an area of about 18.4±9.0 km2 (5.7±2.7%) and 9.0±7.7km2 (3.3±2.8%), respectively, from 1968 to 2006. Similarly, Jaundhar, Jhajju and Tilku glaciers in the Yamuna valley have receded annually at a rate of 34.18, 15.38 and 13.46m respectively between 1962 and 2010.

The glacier area of Shyok valley, Karakoram slightly decreased until 1989 (area 1973: 1613.6±43.6km2, area 1989: 1602.0±33.6km2) followed by an increase afterwards (area 2002: 1609.751.5km2, area 2011: 1615.8±35.5km2). The study also suggests that glaciers in the Karakoram show long-term irregular behaviour with comparatively frequent and sudden advances as compared to central and eastern Himalayan glaciers. Accordingly, the majority of glaciers are retreating in the western, central and eastern Himalaya with variable rates."

8.15 When asked to give details of the Traditional knowledge systems of the Himalayan region that the Ministry has studied so far, DST, in a written reply has furnished as under:

"A Thematic Task Force has been set up under NMSHE entitled "*Network Programme on Convergence of Traditional Knowledge Systems for integration to Sustainable Development in the Indian Himalayan Region*" in year 2015. The key objective of the programme is to develop a sound database on the TKS of the Indian Himalayan Region (IHR). Over 100 relevant national and international journals/magazines consisting nearly 3000 volumes and 9000 issues were surveyed. A total of about 900 research papers/articles were retrieved published on different TKS themes from the IHR by various authors in the browed journals/magazines.

There are more than 170 of the total 701 indigenous groups of India inhabit the IHR and are the repositories of vast array of traditional knowledge. Existence of a number of traditional institutions reflects on the rich social capital and high awareness on the sustainable management of natural resource in the region. Therefore, all through the IHR states, more than 50 indigenous/traditional groups broadly comprising settled farmers, shifting agricultural (Jhum) farmers, transhumant and nomadic pastoralists, local artisans, and traditional healers have been identified for documenting Traditional Knowledge Systems using common methodological framework. General social- cultural profiles with unique traditional knowledge practices of the identified number of local/indigenous communities have been developed. A range of wild plant species used and managed for food, fodder, fuel wood, fiber, timber and most importantly for medicine by a number of local communities has been documented. Similarly, data have been created on different aspects of a variety of traditional farming systems, local innovative farming practices and natural resource based livelihood earning traditions of the identified communities."

8.16 When asked to furnished details of the institutions which house Himalayan traditional knowledge banks, DST, in a written reply, has submitted as under:

"There are over 40 scientific institutions affiliated with different Ministries/Departments working directly or indirectly on traditional knowledge system in IHR. There are over 24 universities including both central and state

Universities located in the IHR and also a few universities located outside the region where relevant departments are engaged in knowledge documentation in the Himalaya as evident from published literature. In addition, a number of community based organizations are also engaged in documentation of TKS at local level in the region.

Adopting case study approach, the Task Force has a number of research partners and also a large number of TKS experts working with other institutes and community based organizations. These have contributed immensely to the progress of work with Task Force."

8.17 In reply to a question regarding the contribution of National Innovation Foundation (NIF) in climate mitigation, DST in the written reply has stated as under:

"National Innovation Foundation - India (NIF) an autonomous institution under Department of Science & Technology, provides incubation support to grassroots innovations i.e. technological ideas and innovations emerging from the unorganized sector of the society and those of the school children.
To take care of grassroots innovation incubation related activities in the Himalayan region/states, NIF has three regional offices located at Srinagar (Jammu and Kashmir), Dehradun (Uttarakhand) and Guwahati (Assam). The role of these regional offices is majorly to identify local innovations from their respective regions, help their validation and/or value additional and facilitate diffusion of these or other innovations useful for the region."

8.18 When asked about the system of gathering traditional knowledge existing in Himalayan region, a representative of the ministry stated as under :

"महोदय, हमारी एक संस्था नेशनल एनोवेशन फाउंडेशन है। यह ग्रास रूट की ट्रेडिशनल नालेज इकट्ठी करती है। इन्होंने काफी अच्छा कार्य किया है, कम्पेंडियम बनाया है विशेषकर नार्थ-ईस्ट की जो ट्रेडिशनल विज़डम है और जो उनकी अप्रोप्रिएट सस्टेनेबल टेक्नोलाजी है, लगभग दो लाख आइडियाज़ उन्होंने जमा किए हैं।"

8.19 When asked about the damage being caused due to activities being undertaken in the region, an expert stated as under:

"The second aspect of the Himalayan Mission is that long before we create emissions and long before someone else's emissions have impacted us (because the people of the Himalayas are not in the fossil fuel economy. They are not causing climate change; but they are suffering from climate change), we are also destroying the ground and making the Himalaya more vulnerable. That is exactly what happened in the 2013 floods. The extreme rain which is the climate event came in two days on 16th and 17th of June. The glacier that is the source of the MandakiniRiver has been melting. When glaciers melt, they form lakes. It is not natural. The creation of glacier lakes is part of this climate change phenomena. When the lake bursts, that is why the Kedar Nath damage was so huge. In addition, they have built so much. Every one wants a five star hotel in

our pilgrim centres. It used to just have a temple and we used to go up to Kedar Nath and Gangotri. The combination of that has been such that there is huge construction. People used to walk to these pilgrim places. But now it has become a picnic spot. We want to have four lane and eight lane highways."

It was further stated ....

"In that big disaster, the debris from the mountains came down. Because of the blasting, they want to put down 500 dams and I have put a list of the dams that they want to build. In large places, the Ganga is already no more flowing. But the tunnels that are being built for the water diversion for hydroelectric dams, they are blasting with dynamite. When that heavy rain came, these mountains which were already cracked with the dynamite, came crashing. With them, came all the debris. There are places where the river level had increased with river deposits up to 40 metres. Those 40 metres height meant bridges went, road went, villages went, new towns went and schools went. I got a SMS from some child saying - मेरा स्कूल बह गया* I thought as to who that crazy child writing to me like this was. I did not know at that time as to what had happened. Children were walking as the bridges had gone and we had to set up transport system and pullies. I cried when I saw children walking eight hours to get to school which was just across the river. When the bridge was there, they would reach in ten minutes. Now they were walking four hours one way and four hours for returning, leaving at 4.00 a.m. and reaching back after dark, with the mountains in a very unstable situation. The issue of the Himalayan Mission needs to also take into account the vulnerability of the Himalayas, the fragility of the Himalaya. What particular patterns of development do we need to increase the resilience because climate will become more extreme?..."

8.20 Regarding retreat of glaciers in the Himalayan region, according to a media report:

"Amid controversy and debate over the precise impact of global warming on the Himalayas, glaciologists analysed a massive cache of data on the mountain range and have concluded that it lost 13 per cent of its glaciers in just four decades. Approximately 443 billion tonnes (Gt) of glacier ice was lost in this timeframe, says a new research paper published in Current Science. It estimates the total glacial water stored in the Indian Himalaya to be around 4,000 Gt….. The scientists reviewed information on 11,000 sq km of Himalayan glaciers — from existing field investigations, satellite imagery, inventories of the Geological Survey of India, scientific papers and maps — and conclude that in fact "most of the Himalayan glaciers are retreating." The rate of retreat however varies from glacier to glacier, ranging from a few metres to almost 61 m/year. Several predictions have been made about the impact of global warming on the Himalayas, many of which have been speculative, not least because of gaps in data, says the paper. One such assessment, it points out, was this (controversial) statement made by the Intergovernmental Panel on Climate Change (IPCC) in 2007: "If the present rate [of glacial retreat] continues, the likelihood of them disappearing by year 2035 and perhaps sooner is very high if the earth keeps

warming at the current rate." While IPCC's hypothesis was erroneous and alarmist, the fact that glaciers are indeed being lost is in no doubt, Prof Kulkarni told The Hindu. "What we find is that Karakoram is the only stable range. The others are retreating at different rates." The investigation also finds that the rate of glacial loss in the Himalayas has accelerated over the decades: from around 9 Gt/year in 1975-85 to 20 Gt/year in 2000-2010. Glaciers are retreating faster in Western Himalaya than in Sikkim, it adds…."

CHAPTER - IX

NATIONAL MISSION ON STRATEGIC KNOWLEDGE FOR CLIMATE CHANGE

9.1 The National Mission on Strategic Knowledge for Climate Change (NMSKCC) is one of the eight Missions of NAPCC being implemented by Department of Science & Technology (DST), Ministry of Science and Technology. The mission aims to achieve the following objectives:

i. Seeks to build a vibrant and dynamic knowledge system that would inform and support national action for responding effectively to the objective of ecologically sustainable development.

ii. Aims at creating institutional capacity for research infrastructure including access to relevant data sets, technologies, computing and communication facilities and awareness to improve the quality and sector-specific scenarios of climate change over the Indian sub-continent.

iii. Seeks to build knowledge and research networks, develop national capacity for modelling the regional impact of climate change on different ecological zones within the country.

9.2 According to the written note furnished by DST, NMSKCC's targets, as given in the mission document and revised deliveries as recommended by a review Committee, are as under:

Sr. No.	**Deliverable as given in the Mission document**	**Revised deliverables as recommended by a Review Committee (May,2016)**
1.	At least 10 thematic knowledge networks with critical mass and strength in the areas of climate science, S&T Capacity building, Regional-climate modeling, Adaptation strategies in agriculture, water resources, and other socio-economic sectors, global technology foresight and regional emission inventories, optimal mix of energy-related technologies, agro biotechnologies for	Creation/Strengthening of about 10 Knowledge Centres at National and State levels including those created/developed as part of Knowledge Networks in the areas of Climate Change Science, adaptation, and mitigation and recommended changes in pathways at the state and national levels

	different agro climatic zones relevant to Indian sub-continent.	
2.	Total number of 10-12 technical reports as a part of implementation of Sub-missions on the key areas of climate change adaptation, mitigation and impact areas such as agriculture, water resources, human health, energy etc,. Technical reports on climate change linkages with extreme atmospheric and ocean events like, Monsoon, tropical cyclones and other storms, floods, droughts, glaciers, etc. will also be brought out.	About 24 technical reports by the National/State level knowledge Centres, institutions and Networks in the areas of climate change science, adaptation, mitigation and impact
3.	Regional and disaggregated climate models taking into account of tropical physics and Indian monsoon-Himalayas interactions	Downscaling of Regional and Global climate models taking into account India-centric regional and local issues
4.	50 Chair professorships in climate change science and technology	No change suggested
5.	About 200 specially trained climate change research professionals with specialization in different areas of knowledge domain and expertise	Development of scientific manpower of about 200 researchers including early career scientists, through capacity building/training programmes in different areas of climate change science, adaptation, mitigation and impact.
6.	At least three viable Public-Private Partnerships in the areas on adaptation and mitigation technologies	To be dropped as sub-committee considered this not feasible

7.	Technology watch groups in the areas of climate change science, renewable energy, clean coal technology, carbon sequestration and storage, water shed management, precision agriculture, convergent technology options for housing and construction, transport, solar energy materials and devices, waste management and S&T policy for climate change research will be developed and positioned with a critical mass of expertise base.	Technology Watch groups in the areas of pursued by the 7 other national missions under National Action Plan for Climate Change (NAPCC) such as Solar energy, Enhanced Energy Efficiency, Sustainable Habitat, Sustainable Agriculture, Green India, Water, Himalayan ecosystem.
8.	Mission deliverables would include enunciated technical goals of the NAPCC document enshrined within the strategic knowledge mission deliverables	To be dropped
9.	Thematic report on Technology-policy interfaces in the areas of energy, per-capita emissions at various GDP growth rates, agro biotechnology directives	Annual updates/reports on Strategic knowledge generated by various programmes/projects taken up under the mission
10.	Development of S&T collaborations with countries like USA, China, Japan and multilateral groups like EU on specific areas identified through internal prioritization	Development of S&T bilateral collaborations in the priority areas of climate change.

Year-wise Allocations of Funds and Expenditure

9.3 As per a note furnished by DST, both NMSHE and NMSKCC were implemented by DST as part of scheme entitled “Climate Change Programme (CCP)”. The details of allocation of funds and expenditure in respect of CCP are given below:

	Total Allocation (in Cr of ₹)			Actual Expenditure (in Cr of ₹)			%age utilization
Budget Head / FY	**Capital**	**Gen.**	**Total**	**Cap.**	**Gen.**	**Total**	
2011-12	3.74	4.10	7.84	3.74	4.10	7.84	100
2012-13	13.20	6.21	19.41	13.2	6.21	19.41	100
2013-14	3.30	5.69	8.99	3.30	5.69	8.99	100
2014-15	12.0	12.0	24.0	11.85	11.89	23.74	99%
2015-16	15.0	20.0	35.0	4.77	11.12	15.89	45%
2016-17	30.0	25.0	55.0	19.99	23.51	43.47	79%
Total	**77.24**	**73.0**	**150.24**	**56.85**	**62.52**	**119.37**	**79.5%**
2017-18 (till 05.07.2017)	23.5	28.0	51.5	6.57	10.80	17.37	34%

Details of Activities undertaken so far and their Outcomes/Outputs

9.4 As per the written note of DST, as part of initiatives under NMSKCC, a number of activities were initiated during past 4 years which include the following:

i. Eight Centres of Excellence and 20 Major R&D Programmes

ii. 10 State Climate Change Centres

iii. Three National Network Programmes

iv. Seven Human Capacity Building Programmes

v. Eight Global Technology Watch Groups (GTWGs)

vi. Indo-US Fulbright-Kalam Doctoral and Post-Doctoral Fellowships in Climate Change (annually 6 fellowships)

I. Centres of Excellence and Major R&D Programmes

9.5 As per a note furnished, DST had undertaken an objective assessment of top 100 Indian institutions and Experts working in the fields of climate and climate change

areas with the help of SCOPUS data. Based on these data, top 30 institutions were invited to submit major programmes/ projects in the climate change science, adaptation and mitigation areas for establishing Centres of Excellence and major R&D Programmes.

9.6 Following a three stage peer review process and assessment by the DST's Expert Committee, the following Centres of Excellence and major R&D Programmes were finalized and launched.

a. Centres of Excellence

i. Centre for Climate Studies, IIT Bombay

ii. Divecha Centre of Climate Change, IISc, Bangalore

iii. Climate Change research for Plant Protection (CCRPP), ICRISAT Hyderabad

iv. Indo-German Centre for Sustainability, IIT, Madras

v. DST's Centre for Climate Modeling, IIT Delhi

vi. Mahamana Centre for Climate Change, BHU, Varanasi

vii. DST's Centre for Climate Studies, IIT Kharagpur

viii. DST-ICMR Centre for Climate Change and Vector Borne Diseases, NIMR, Delhi

b. Major R&D Programmes

i. NIO, Goa (Sea Level rise)

ii. NBRI, Lucknow(Forest Ecosystem in Indo-Gangetic Plains)

iii. IARI, Delhi (CC Adaptation in Agriculture)

iv. Delhi University, Delhi (Climate-Stress resource management)

v. Tamilnadu Agricultural University, Coimbatore (CC Impacts, Adaptation and Mitigation Strategies for Agriculture)

vi. IIT, Delhi (Regional Climate Modeling)

vii. Birbal Sahni Institute of Paleosciences, Lucknow(Quaternary CC)

viii. NIO, Goa (Ocean Acidification)

ix. Institute of Rural Management Anand (Sustainable Livelihoods)

x. IRADe, Delhi (Socio Economic Vulnerability)

xi. University of Allahabad (Extreme Rainfall Events)

xii. IIT, Delhi (Storm Surges)

xiii. IISER, Pune (Decadal to centennial variability of Monsoon)

xiv. Cochin University of Science and Technology (Climate modeling)

xv. IISc Bangalore (Geoengineering Modelling)

xvi.

xvii. Andhra University (Climate Modeling)

xviii. IIT Guwahati (CC impact on crop water requirements and productivity)

xix. IIT Bhubaneshwar (Effect of CC on hydro-met processes)

xx. IISER Mohali (Atmospheric chemistry of Climate change)

xxi. NBRI, Lucknow (CC Adaptation for rice Indo-Gangetic Plains)

II. State CC Centres/Cells

9.7 DST refers in a note that as part of deliverables of NMSKCC, there was a requirement to establish State CC Centres/Cells in each of the non-Himalayan States and Union Territories in the country. The Prime Minister's Office while reviewing these missions has from time to time emphasized the need and urgency to take up this action on priority. DST initiated action of establishing such centres way back in 2012. DST has so far supported State CC Centres in 10 Non-Himalayan States/UTs. A list of these states is given below:

Sl. No.	**Name of State**
1	Madhya Pradesh
2	Punjab

3	Chattisgarh
4	Karnataka
5	Kerala
6	Maharashtra
7	Orissa
8	Pondicherry
9	Tamil Nadu
10	Telangana

9.8 It has also been stated that the above State CC Cells have been tasked to carry out several activities that connect their State Action Plans on CC with NMSKCC priorities of action which include:

(a) Vulnerability & risk assessment at district & sub-district levels in accordance with a standard national framework;

(b) Human capacity Building programmes;

(c) Public awareness programmes and

(d) Institutional capacity building programmes.

III. National Knowledge Network Programmes in the areas of Climate Change Science, Adaptation and Mitigation

9.9 It has been stated in the written note of DST that the following three National Network Programmes have been launched by DST as part of activities under NMSKCC:

a) National Network Programme in Climate Change and Human Health with 19 projects in four thematic areas viz., Heat Stress, Vector-borne diseases, Air pollution, Water-borne diseases and Tribal diseases.

b) National network programme on climate Modeling with 13 projects in different thematic areas

c) National Network Programme on Climate Change and Coastal Vulnerability with 10 projects in different thematic areas

IV. Human Capacity Building Programmes

9.10 DST has initiated seven Human Capacity Building Programme for training of professional and stakeholders in certain key science, adaptation and mitigation areas of climate change. These programmes are anchored around the following six lead institutions.

a. Administrative Staff College of India (ASCI), Hyderabad
b. Indian Institute of Public Administration (IIPA), New Delhi
c. Tata Institute of Social Sciences (TISS), Mumbai
d. Indian Institute of Forest Management (IIFM), Bhopal
e. Ashoka Trust for Research in Ecology and the Environment (ATREE) Bangalore
f. Visvesvarya National Institute of Technology (VNIT), Nagpur

9.11 As part of these initiatives as many as 1300 personnel are proposed to be trained in next 3 years.

V. Global Technology Watch Groups (GTWGs)

9.12 According to the written note furnished by DST, it has been stated that as part of deliverables of the NMSKCC, Global Technology Watch Groups (GTWGs) were required to be set up for technology assessment, evaluation, prioritization, risk assessment and foresight in the areas of climate change adaptation and mitigation. The basic purpose of setting up of GTWG is to have an independent, standing think tank mechanism that performs a number of critical functions including alerting, assessment, evaluation, prioritization, etc. Technology being dynamic which evolves continuously, GTWG need to be institutionalized within some well identified and established institutions. Moreover, as part of International negotiations for climate change, there was a need to come up with the country-specific Technology Needs Assessments (TNAs). The GTWG outcomes are targeted to meet the requirements of TNAs.

9.13 Details of eight different sectors in which GTWGs has been set up and agency are as under:

Sl. No.	GTWG Sector	Piloting agency
1.	Renewable Energy Technology	National Institute of Advanced Studies (NIAS), Bangalore;
2	Advanced Coal Technology	IIT Madras
3	Water Resources	
4	Sustainable Agriculture	
5	Sustainable Habitat	TIFAC, New Delhi
6	Energy Efficiency	
7	Green Forest	
8	Manufacturing	

VI. Fulbright-Kalam Doctoral and Post-Doctoral Fellowships in Climate Change

9.14 As per the note furnished by DST, tt has also been stated that in a September 2014 Joint Statement, the President of the United States of America and the Prime Minister of India launched a new US-India Climate Fellowship Program to build long-term capacity to address climate change related issues in both countries. In pursuance of this statement, the Fulbright-Kalam Climate Fellowship programme was launched. The United States-India Educational Foundation (USIEF), New Delhi is administering the Doctoral and Post-doctoral fellowship programme on behalf of both governments.

9.15 The selection process for first batch of 6 candidates is completed. The call for proposals for second batch of candidates for above fellowship for the academic year 2018-19 has been announced.

Impacts/Benefits to the Nation/Society

9.16 DST has listed the following as impacts/benefits to the Nation and Society by NMSKCC:

a) The Mission has enabled creating a network of over 125 institutions and 400 scientists to work on climate change related research areas

b) Mission supported projects provided new indirect job opportunities to over 250 project personnel during last 3 years

c) Strategic knowledge emanating from the mission will be used for formulating national policy and for international level negotiations

d) As many as 118 students were enrolled for PhD and PG programmes. 153 Workshops were organized wherein over 4000 personnel were trained.

e) As part of support provided by mission to the State CC Centres, as many as 156 training programmes were organized wherein 14000 personnel were trained

f) 25 national level workshops/seminars/conferences on earth sciences areas were supported wherein over 1500 participants attended

Part - II

Observations/Recommendations

Introductory

The Committee note that the climate change poses a major threat to the world today in view of its far-reaching implications for environment, agriculture, water availability, natural resources, ecosystem, biodiversity, economy and social well-being. As per the series of assessment reports of the United Nations Inter-Governmental Panel on Climate Change (IPCC), human influence on the climate system is clear, and recent anthropogenic emissions of green house gases (GHG) are the highest in history.

The data/information furnished by the Ministry of Environment, Forest and Climate Change (MoEF&CC) states that the quantum of impact of the global warming over smaller regions are uncertain and are under further investigation. In line of rising temperature across the globe, all India mean temperature has risen nearly around 0.60ºC over the last 110 years. As per Government's data, the climate change may result in reduction of agriculture yield, wheat yield to reduce by 6 to 23 percent by 2050, maize yield to decrease by 18 percent, if no adaptation is followed. The climate change may also affect the quality of food grains in terms of reduced concentration of grain protein and some minerals like zinc and iron due to elevated CO_2. Besides, global warming is likely to lead to a loss of 1.6 Mt milk production by 2020 and 15 Mt by 2050 if no adaptation is followed. Climate change is projected to increase soil erosion, affect water availability and quality. As mentioned in Annual Report 2017-18 of the Ministry of Earth Sciences, the analysis of last 26 years data with regard to shoreline changes along Indian coast suggests that about 33 percent of coast is eroding and another 29 percent is accreting. As per the studies carried out by the Centre for Glaciology (CFG) at Wadia Institute of Himalayan Geology (WIHG) Dehradun, Dokriani Glacier retreated at an annual rate of 16.5 m during 1962 to 1991, 17.8 m from 1991 to 2000, 15.7 m for the periods of 2000-2007 and 18.5 m during the period between 2007 and 2015. Conversely, Chorabari Glacier retreated 6.4 m per year during

1962 to 2003 and 9.3 m per year from 2003 to 2014. Further as per Satellite remote sensing-based studies carried out by CFG, WIHG, the majority of glaciers are retreating in the western, central and eastern Himalaya with variable rates.

The Paris Agreement (2015) during the 21st Conference of Parties (COP21) called for Intended Nationally Determined Contributions (INDCs) to GHG emission reduction to limit global warming below 2ºC and as close to 1.5ºC as possible. In response, the Indian Government has ratified the deal in October, 2016 for reduction of emission intensity (emission per GDP) by up to 35 percent by 2030 relative to that in 2005, and create a terrestrial carbon sink of up to 3 Pg-CO_2 (1 Pg = 10^{15} g) by 2030.

The Committee observe that the issue of climate change is bothering the whole planet. Our planet was created as a plush green habitable planet with so much of diversity, richness of climate, agro-zones, climatic-zones, but all of them are slowly changing. Some of them have vanished and some of them are on the verge of vanishing. One of the important contributors to this change is human activity, which may also be coupled with some natural conditions. It is one of the most important questions, which concerns all of us both for the sake of development and for the sake of health, agriculture and so many other aspects of human life - flora and fauna and environment. In the Indian context, the Committee find that the task of maintaining the necessary economic growth becomes more challenging in view of country's dependence on climate sensitive sectors such as agriculture and forestry. There is a need to take urgent and immediate attention to one of the most important issue concerning the survival of our planet by way of a multi-pronged strategy to tackle the challenging problem of global warming, i.e., by taking initiatives for GHG emission reduction as well as for the sustainability of the natural resources despite pressures from the adverse impacts of climate variability and change and build resilience to the changing multi-hazard risk and vulnerability.

In India, traditionally, our scriptures have underlined the importance of protecting environment. A *shloka* in Matsya Purana reads as under:

दश कूप समा वापी, दशवापी समोहद्रः।
दशह्रद समः पुत्रो, दशपुत्रो समो द्रुमः।

(One tank equals ten wells, one pond equals ten tanks, ten ponds equals one Son and one tree equals ten sons.)

Similarly, Atharvaveda says:

'वर्षेण भूमिः पृथिवी वृतावृता सानो दधातु भद्रया प्रिये धामनि धामनि'

(Right rain causes earth and its environment to become pleasant which leads to welfare of all people.)

Our epics and other religious texts have numerous other references which say that the trees, rivers, water, mountains, etc. are sacred and we need to fully respect them. Therefore, from ancient times our civilisation has been cognizant of environmental issues and necessity of protecting it to ensure our survival.

In order to achieve a sustainable development path that simultaneously advances economic and environmental objectives, the National Action Plan for Climate Change (NAPCC), which comprises of eight Missions being handled by the respective Ministries, has been launched by the Government of India which outlines a number of steps to simultaneously advance India's development and climate change related objectives of adaption and mitigation. The Committee have examined various issues related to the subject which includes functions, achievements and constraints of these eight Missions after detailed deliberations and made observations/recommendations in this regard which are discussed below.

<u>National Action Plan on Climate Change – Need for integrated approach and coordination amongst various Ministries/stakeholders handling eight Missions and setting up of new Missions</u>

2. The Committee find that the Government is implementing the National Action Plan on Climate Change (NAPCC), which includes eight national Missions covering solar energy, enhanced energy efficiency, agriculture, water, sustainable habitat, Green India, Himalayan ecosystem and Strategic Knowledge

for Climate Change, apart from various other initiatives. Each Mission is administered by a Ministry/Department which is responsible for its implementation and lays down the budget provisions and actionable priorities for it. The broad policy initiatives of the Central Government are supplemented by actions at the sub-national levels by the State Governments/UTs. The National Bank for Agriculture and Rural Development (NABARD) has been appointed as National Implementing Entity (NIE) responsible for implementation of adaptation projects under the National Adaptation Fund for Climate Change (NAFCC). Besides, research and scientific institutions provide scientific inputs for framing various policies on climate change.

Some of the experts who deposed before the Committee raised the issue of fragmented approach and lack of coordination amongst various Ministries/ Stakeholders. The Committee find that the activities covered by various Missions are inter-related and the developments in a Mission in an area has bearing on the other Missions. NAPCC being a multi-tiered structure with various Ministries/ Departments administering various Missions supplemented by actions at the States/UTs level, the objectives of the action plan for climate change can only be achieved through collective action and partnerships for which integrated approach and coordination amongst various Ministries, State Government/Union Territories and all other implementing agencies is utmost necessary. The Ministry of Environment and Forests & Climate Change (MoEF&CC) being the main coordinating Ministry has to take the desired initiatives. For inter-Ministerial coordination, the Committee recommend for setting up of an inter-Ministerial entity to quarterly review the performance of each implementing agency. Besides, MoEF&CC should have a public information portal displaying up-to-date data/information about mandate, targets as well as achievements of each of the Missions under specific heads so as to enable the stakeholders to track what is happening in different areas concerning climate change. Besides, the information about the adverse effects of climate change should be displayed in the portal so as to sensitize and involve the public at large on this important issue. The Committee would also like to recommend that six monthly report of

each Ministry/Department administering the specific Mission(s) giving the status of implementation on various parameters should be laid in Parliament.

3. The Committee note from the information furnished by the Government that 32 States and Union Territories have so far put in place the State Action Plans on Climate Change attempting to mainstream climate change concerns in their planning process. The Committee would like to be apprised about the implementation status of the State Action Plans at the ground level. About the remaining States where State Action Plans have not been formulated, the Committee would like to be apprised about the specific reasons for delay in formulating State Action Plans. These States should be pursued for putting in place State Action Plans expeditiously.

4. The Committee during the course of deliberations have been apprised by a representative of the Ministry of Earth Sciences that the proposal for setting up a National Coastal Mission has been prepared jointly with MoEF&CC and is at the advanced stage of approval. With the high Shoreline Vulnerability along Indian Coast as mentioned in the para above, the Committee strongly recommend for setting up of a new Mission i.e. National Coastal Mission so as to give focused attention to climate change issues related to coastal areas. The Committee would also like to be apprised as to whether the Government propose to set up some more new Missions in areas like health, waste-to-energy.

<u>Clean Environment Fund and National Adaptation Fund - Financial Achievement</u>

5. The Committee note that a corpus called National Clean Energy Fund (NCEF), now known as Clean Environment Fund, was constituted in the Financial Year 2010-11 out of the cess on coal produced/imported ("polluter pays" principle) for the purposes of financing and promoting clean energy initiatives, funding research in the area of clean energy or for any other purpose relating thereto. Subsequently, the scope of the fund was expanded to include clean environment initiatives also. An Inter-Ministerial Group (IMG) chaired by the Finance Secretary approves the projects/schemes eligible for financing under the NCEF. These projects include innovative schemes like Green Energy Corridor for

boosting up the transmission sector, Namami Gange, Green India Mission, National Solar Mission (NSM)'s installation of solar photovoltaic (SPV) lights and small capacity lights, installation of SPV water pumping systems, SPV Power Plants, Grid-Connected Rooftop SPV Power Plants, pilot project to assess wind power potential, etc. The Committee note that from 2010-11 to 2017-18, a total of ₹86,440.21 crore was collected as coal cess out of which only ₹20,942.29 crore could be transferred to the NCEF. During this period, total amount financed from NCEF for projects was ₹15,911.49 crore. The Committee further note that monies from the Fund are allocated to the Ministries of Environment, Forest and Climate Change, New and Renewable Energy and Water Resources, River Development and Ganga Rejuvenation. The Committee are concerned to note that in spite of substantial revenue being generated out of coal cess, the same is not being allocated to the NCEF and even the low allocation is not being utilised, which indicates poor planning and execution on the part of implementing agencies. The Committee also understand that the coal cess, along with some other cesses, have been made a part of GST compensation Fund which would be utlilised to compensate the States for five years for potential losses on account of GST implementation. After five years, any amount left would be shared on 50 percent basis between the Centre and States. The Committee deplore the way such an important issue pertaining to the existence of the Earth, the only known habitable planet in the Universe, is being handled and strongly recommend for adequate financial resources to NCEF, besides putting in place effective monitoring mechanisms to ensure full utilization of allocated outlay. The Committee also recommend that shortfall on account of the Coal cess being made a part of GST Compensation Fund should be compensated to the NCEEF by the Central Government.

6. The Committee note that the National Adaptation Fund for Climate Change (NAFCC) was set up in 2015-16 with a budget provision of ₹350 crore for the year 2015-16 and 2016-17 and an estimated requirement of ₹181.5 crore for the financial year 2017-18. The objective of the Fund is to assist States and Union Territories particularly vulnerable to the adverse effects of climate change in meeting the cost of adaptation. NABARD is the implementing agency for this

Fund. Under the Fund, ₹118.37 crore were released for projects in 2015-16 while ₹93.93 crore were released in the year 2016-17. The Committee observe that against the allocation of ₹350 crore for two years, only ₹212.3 crore i.e. around 60 percent has been released which indicates slow and tardy pace of implementation of the projects. While expressing concern over lack of seriousness towards implementation of projects funded by NABARD, the Committee recommend to review the implementation of the projects being undertaken in various States/UTs. The details of the progress of these projects being implemented in various States/UTs alongwith the initiatives taken/ proposed to be taken for their effective implementation should be furnished to the Committee within three months of the presentation of the Report.

National Solar Mission (NSM)

7. The Committee note that the NSM was launched in 2010 with an initial target of generating 20000 MW of grid-connected solar power by 2022. The targets were subsequently increased to 100000 MW by 2021-22, 40 percent of which is to be sourced from grid-connected rooftop projects and 60 percent from land-based solar power projects. The Committee also note that the total investment in setting up the targeted solar power is ₹6,00,000 crore. The funding requirement for the targeted solar power generation will be met from budgetary support, internal and international financing. A major part of funding requirement will have to be met through funding by the financial institutions - both domestic and international. The Government has also come out with Viability Gap Funding (VGF) scheme for certain solar power plants. So far as Government funding is concerned, in 2016-17 ₹2541.15 crore (actuals) was allocated for NSM while in 2017-18 (RE) the allocation declined to ₹2102.10 crore. In 2018-19, the BE was ₹2893.74 crore. The Government's outlay for the 12th Plan period is ₹13,690 crore, which is barely a fraction of the required investment.

The Committee fail to understand as to how the enhanced targets of generation of 100000 MW of solar power by 2021-22 would be achieved in the aforesaid scenario whereby there is no clarity about the sources of funding for

the National Solar Mission. The Committee may like to emphasize that with the cost of solar power consistently declining, effective implementation of Solar Mission has the potential to transform the renewable energy sector and promote ecologically sustainable growth while addressing India's security challenge for which adequate financial resources are required. The Committee, therefore, strongly recommend that an analysis of financial support from each of the source viz. budgetary support, private investment, viability gap funding, international aid should be undertaken by the Government and the revised mission document be brought out indicating therein clearly about the sources of financing.

8. The Committee find from the data made available by the Ministry of New and Renewable Energy that whereas the performance of NSM during Phase-I (2010-2013) remained satisfactory with achievement of installation/sanctioned solar power generation both grid and off-grid, i.e., 1938.94 MW surpassing the targets of 1300 MW and installation of 7.01 million sq.m of collector areas against the target of 7 million sq.m, the performance has slowed down during Phase-II (2013-2017) of the Mission. The targets of 15900 MW under grid-connected solar power could not be achieved fully with achievement remaining 10602.83 MW thus the shortfall being 5297.17 MW. Under the off-grid solar applications segment, although the power sanctioned, i.e., 713 MW surpassed the targets of 600 MW, the installed power remained just 345.5 MW. Under Solar Thermal Collectors Segment, there is under-achievement of targets, achievement being 5 million sq.m against the targets of 8 million sq.m. So far as the performance during the year 2017-18 is concerned, although tenders have been issued in respect of 22945 MW, the power commissioned is just 4804 MW. For another 10048 MW, PPA has been signed but it is not commissioned.

The Committee express strong concern over the slowdown of the performance under the Solar Mission during Phase-II and recommend to critically review the performance so as to understand the reasons for the shortfall in achieving the set targets. Since Phase-III of the Mission has already commenced, it is utmost necessary to take the corrective actions besides

effective monitoring of the projects so as to achieve the ambitious target of 100000 MW by 2021-22.

9. So far as State-wise commissioning of grid-connected solar projects is concerned, there is uneven performance in various States. Whereas Andhra Pradesh, Rajasthan, Tamil Nadu, Telangana, Gujarat, Karnataka, Madhya Pradesh and Punjab remained the first eight leading States with total cumulative capacity in MW as being, 1998.83, 1871.22, 1697.32, 1609.27, 1249.37, 1082.48, 857.04 and 809.45 respectively, the performance in some other big States having larger area of land like Maharashtra, Uttar Pradesh, J&K, Odisha and Chhattisgarh, not so encouraging. The Committee recommend that the Ministry should review State-wise performance of the projects and take the required initiatives particularly in remote and hilly areas.

10. The Committee note that one of the objectives of the Mission is to take a global leadership role in manufacturing of cutting edge solar technologies with a target of 4-5 GW equivalent of installed capacity by 2020, including setting up of dedicated manufacturing capacities for poly silicon material to annually make about 2 GW capacity of solar cells. However, given the existing position of solar-related manufacturing capacity within the Country, it is likely to remain a pipedream, as the Ministry itself has acknowledged that the country currently does not have enough capacity for solar cells and modules to cover full demand, and both imported and indigenous solar equipments and components are being utilized for achieving the targets. In this context, a representative of the Ministry apprised the Committee during the course of oral evidence that in solar industry, Chinese solar cells and modules are being used in the Country in high volumes. The Committee may also like to refer to the 22nd Report (2017-18) of the Committee on Public Undertakings, wherein a representative of IREDA has been stated to have apprised that Committee that 85 percent of the solar panels are still being imported from China as they are cheaper and technologically advanced.

The Committee are concerned to note such high dependence on imported solar equipments which is not in the interest of the Country and is detrimental to

the development of indigenous industries. The Committee strongly feel that there is an urgent need to work on various fronts, foremost being R&D for which massive investment is required. The Ministry of Science and Technology has to work in a mission mode to encourage R&D in the sector at research centres particularly the premier technological institutions like IITs in collaboration with industry for technological improvement as well as to develop affordable and innovative solutions so as to bring down the costs, improve quality of solar power components including solar panels, solar cells and batteries. Besides encouraging local manufacturing of raw material, attracting private sector particularly the small scale industries, availability of skilled manpower are the other areas for which the Government has to take urgent and immediate initiatives. The Government should also look at the option of increasing duties on Chinese solar products without attracting the restrictions laid sown under WTO guidelines. Research and further improving the quality of lithium batteries or batteries based on alternate materials should be incentivised.

National Mission on Enhanced Energy Efficiency

11. The Committee note that the National Mission on Enhanced Energy Efficiency (NMEEE), one of the eight missions under NAPCC, was launched in the year 2010 with an approved outlay of ₹235.50 crore during XI plan and ₹775 crore during XII plan. The aim of the NMEEE is to strengthen the market for energy efficiency by creating conducive regulatory and policy regime and envisages fostering innovative and sustainable business models to the energy efficiency sector. The Committee also note that between the period 2010-11 and 2016-17, ₹914.13 crore was allocated as BE while RE during the same period was only ₹258.84 crore. The Committee are surprised that even this drastically reduced amount could not be spent under the mission and actual expenditure during the same period was ₹207.82 crore, about 20 percent less compared to RE. The Committee have been informed that one of the reasons for less financial allocation under RE is delay in approval of rules for Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) and Venture Capital Fund for Energy Efficiency (VCFEE) and also because XII plan scheme was approved only in 2014-15. The

Committee feel that mismatch of such magnitude in financial allocations for such an important mission does not reflect well on the functioning of Ministry. The Committee, therefore, recommend that the Ministry should undertake due diligence in preparation of financial estimates and ensure that the funds are utilised for the schemes for which they have been allocated.

12. With regard to the pace of allocations of outlay, the Committee find reducing allocations since 2014-15 till 2017-18, whereby the allocations at BE to the tune of ₹283 crore during 2013-14 were gradually reduced to ₹40.90 crore during 2017-18. The allocations during 2018-19 then suddenly surged to ₹182.55 crore. The Committee would like to be apprised of fluctuation of this scale in the Budgetary allocation of these years. The corresponding physical targets and achievements under NMEEE during this period may also be furnished to the Committee at the action taken stage.

13. The Committee note that the objective of the Mission is to upscale the efforts to unlock the market for energy efficiency which is estimated to be around ₹74,000 crore and help achieve total avoided capacity addition of 19,598 MW, fuel savings of around 23 million tonnes per year and greenhouse gas (GHG) emissions reductions of 98.55 million tonnes per year at its full implementation stage. To achieve its aim, NMEEE spells out four initiatives to enhance energy efficiency in energy intensive industries. The first initiative is Perform Achieve and Trade Scheme (PAT) scheme providing for mandatory energy saving targets for Energy Intensive industries. The Committee note that the targets set under this have broadly been achieved and 8.67 million tonnes oil equivalent (MTOE) saved while CO_2 mitigation was of the order of 30 million tonnes. The Committee, however, feel that the targets set under PAT cycle I were modest and that was the reason they were achieved in spite of less financial allocation and utilisation. PAT cycle II and III covering the period 2016-19 and 2017-20 respectively expands the vertical as well as horizontal coverage of the scheme. The Committee feel that the focus of the scheme is on incrementally reducing energy consumption in industries that are energy intensive. The Committee recommend for giving emphasis to R&D for energy efficient technologies for which adequate

investment is required. The Committee also recommend to incentivize start-ups to encourage them to come to solar energy sector which would help in bringing innovations to this field.

14. The Committee note that one of the initiatives under the mission is Market Transformation for Energy Efficiency (MTEE) under which Bachat Lamp Yojana (BLY) and Super Efficient Equipment Programme (SEEP) is undertaken. The BLY is a public-private partnership program comprising of Bureau of Energy Efficiency (BEE), Distribution Companies (DISCOMs) and private investors to accelerate market transformation in energy efficient lighting. After initially replacing incandescent bulbs by CFLs, BEE is now promoting use of LED lights using the institutional structure of BLY Programme.Under SEEP, appliances are identified and through fiscal incentives, their super-efficient versions are promoted. The Committee have been informed that 70 W ceiling fans have been identified as the first appliance under the programme. As regards the BLY, the Committee agree that installing LED bulbs have resulted in energy savings, but there is a bigger problem of disposal of waste which the programme does not address. The wrong disposal of incandescent bulbs and CFL which were replaced by LED will create a huge ecological problem. Similarly there is no awareness campaign for consumers about the ways to correctly dispose the bulbs, CFLs and LEDs. The Committee, therefore, recommend that the Ministry should take adequate steps to make people aware about how to dispose such waste so that they do not create environmental problems. As regards SEEP, the Committee feel that energy guzzling appliances such as air-conditioners, microwave ovens, geysers have to be expeditiously included in the programme for maximum impact on energy savings. Similarly, alongwith replacement of CFLs and incandescent bulbs, the wires and switch boxes which have become very old and obsolete also need to be replaced to attain better energy efficiency.

15. The Committee would also like to recommend for use of energy efficient appliances in the Government buildings for which LED lights, BEE rated 5-star ACs and ceiling fans should be retrofitted in the existing Government buildings.

In the newly constructed buildings, the use of energy efficient appliances should be made mandatory.

National Water Mission

16. The Committee note that National Water Mission (NWM) is one of the key missions under the NAPCC as water is likely to suffer most from adverse impact of climate change. Water quality and availability will be impacted due to higher incidence of floods and droughts, groundwater recharge will be impacted and rising sea level will threaten coastal habitats. The Committee also note that the objectives of the mission include conservation of water, minimum wastage and ensuring equitable distribution of water through integrated water resources development and management. Major components of this Mission are development of comprehensive water database and assessment of impact of climate change on water resources, promotion of water conservation, augmentation and preservation, focused attention to over-exploited areas, enhancing water use efficiency by 20 percent, and promotion of basin level integrated water resources management. The Committee have been informed that a comprehensive exercise to map all the water bodies in the Country is underway. In this connection, the Committee may refer to the Composite Water Management Index, 2018 of NITI Aayog, wherein it is stated that data (of water availability), where it is available, is often unreliable due to the use of outdated collection techniques and methodologies. For example, groundwater data in India is based on an inadequate sample of 55,000 wells out of a total 12 million in the country and siloed information collection and sharing, especially between States, adds significantly to costs and inefficiencies. The Committee strongly emphasize that the real-time data about availability of water in the country from all the sources is utmost necessary for a sound water planning and as such recommend to review the out-dated techniques and methodologies of data collection and prepare a comprehensive realisitic database of all water bodies covering entire aquifers, borewells, *baolis*, ponds, ponds/wells which have been abandoned, missing rivers, the dark zones, etc. at the earliest.

17. The Committee have been apprised that aquifer mapping is going on and the target for XII Plan is 0.9 million sq.km for XII Plan out of 2.3 million sq.km in the 8 States, Haryana, Punjab, Rajasthan, Gujarat, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu and Bundelkhand areas of UP/MP. Out of the target of mapping of 8.89 lakhs sq.km, 6.31 lakh sq.km could be mapped upto March, 2017. The Committee would like to be apprised of the present status of mapping in these States.

18. The data furnished by the Ministry with regard to financial allocation and expenditure indicates a dismal performance of the National Water Mission. During the years 2013-14 to 2016-17, whereas ₹195 crore were allocated at Budget Estimates stage, the allocations were drastically reduced to ₹17.45 crore at RE stage which too could not be utilised fully, expenditure being just ₹13.22 crore. The very poor position of financial achievement is indicative of the low performance of the mission during these years. Besides the financial allocations at budget estimates stage are being reduced year after year, the allocation of ₹110 crore during the year 2013-14 came down to ₹15 crore during the year 2017-18. The Committee are not able to comprehend the poor financial achievement particularly when the problems related to water are increasing year after year, the number of over-exploited Blocks increasing from 802 during 2009 to 1034 during 2013, the critical Blocks increasing from 169 to 253, semi-critical Blocks increasing from 523 to 681 and Saline Blocks rising from 71 to 96 during this period. Not only that as per Government's data, there is a water scarcity of 1000 metre/person/year, the per capita water availability is constantly decreasing with 5000 m3/year during 1951 to 1545 during 2011 and the expected further decline is to 1140 by the year 2051. The Committee take strong exception to the way such an important mission related to water is functioning as is apparent from the status of financial achievement and would like the Government to analyse the performance of the mission and take all the desired corrective action to address the various areas related to water availability and quality in various States/UTs.

19. The Committee note that the targets of the mission include promotion of citizen and state actions for water conservation, augmentation and preservation

and focused attention to vulnerable areas including over-exploited areas. Also, State Specific Action Plans (SSAP) for water sector covering irrigation, agriculture, domestic water supply, industrial water supply and waste water utilization in respect of all the States/UTs are being prepared. The Committee, however, note that there is no mention of people centric programmes and benefits and promotion of traditional knowledge of water conservation existing in the Country in the mission documents. The Committee are of the view that various regions in the Country have well developed and effective scientific traditional systems of water conservation suited to their areas and the mission needs to benefit from traditional knowledge. The Committee recommend for restoring/reclaiming water bodies in cities as they act as sponges at the time of excess rain and store water for supply when there is no rain.

20. The Committee note that as per the data maintained by the Central Ground water Board, 85 percent of the rural population uses groundwater for drinking and other domestic purposes. High concentration of fluoride in ground water beyond the permissible limit of 1.5 mg/L is a major health problem in India. Due to excess fluoride in ground water, a huge rural population is threatened with health hazards of Fluorosis. 184 districts in 19 States of the Country are especially vulnerable in this regard. Similarly, arsenic contamination is another area of concern. Nitrate contamination is mainly from man-made activities. In India, high concentration of nitrate (more than 45 mg/l) has been found in a large number of districts of Andhra Pradesh, Bihar, Delhi, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu, Rajasthan, West Bengal and Uttar Pradesh, the highest value being 3080 mg/L found in Bikaner, Rajasthan. The Committee find that there is no centralised research centre for checking and preventing the presence of arsenic and fluoride contamination of water in the country. The contaminated water has resulted in a number of deaths and affects not only human beings but also animals, fishes and horticulture. The Committee take a serious note over lackadaisical attitude of the Government in regard to ground water monitoring and recommend that immediate steps be taken to set up state of the art research centres in all major cities for monitoring of groundwater in all regions of the Country. The Committee

also recommend to provide sufficient manpower and equipments for the research centres.

21. The Committee in their 24th Action Taken Report (16th Lok Sabha) on the subject 'Ganga Rejuvenation' pertaining to the Ministry of Water Resources, River Development and Ganga Rejuvenation had expressed serious concern over the way different studies on Arsenic are denied funds/support by the different Ministries/Departments which include "Studies on genesis of arsenic occurrence in Ganga-Brahmaputra basin" by NIH- Roorkee which is awaiting financial approval and another study namely "Study on groundwater dynamics and geochemical processes of arsenic mobilization in the Middle Ganga aquifers for in-situ arsenic remediation" was declined the support on administrative ground. The Committee are not able to understand denial of financial support to such an important studies related to Arsenic particularly when the budgetary allocations made to the mission have remained unutilised and budgetary allocation have been drastically reduced year after year, particularly when it is utmost necessary to identify sources to conclusively establish the mobilization process which helps in arsenic release from Minerals to groundwater to address the issue of arsenic in water. While reiterating their concerns/observations, the Committee would like to be apprised about the status of various studies related to arsenic being undertaken in the country and their financial and physical achievements status.

22. The Committee find that the Composite Water Management Index of NITI Aayog mentions about the country facing the worst water crisis in its history with 600 million people facing high to extreme water stress, about 2 lakh people dying every year due to inadequate access to safe water. What is worrying more, as per the findings of the report, is that the crisis is going to get worse with country's water demand projected to be twice of the available supply by 2030, implying severe water scarcity for hundreds of millions of people and an eventual 6 percent loss in the country's GDP. To add to the great gaps between the demand and availability of water, inter-State disagreements are on the rise, with seven major disputes currently raging, pointing to the fact that limited

frameworks and institutions are in place for national water governance, as reported by NITI Aayog in its report .

While taking note of the alarming water scenario as projected by NITI Aayog in its report, as stated above, the Committee emphasize for taking urgent and immediate actions on various fronts. For effective water management, there is a need for a well drafted and well regulated National Water use Policy which clearly delineate the use of water by different sectors viz. agriculture, industry, domestic etc. The Committee further note that so far as water consumption is concerned, ways of living in the city are unsustainable because of excessive wastage of water. In some States, wastage of water is rampant because of faulty cropping patterns and also because free electricity and water is being provided. The NAPCC sets a goal of a 20 percent improvement in water use efficiency through pricing and other measures to deal with water scarcity.

The importance of clean water has been highlighted in the Atharva Veda, as quoted in the 15th report of the Committee on the subject 'Ganga Rejuvenation'. Even at the cost of being repetitive, the Committee would again like to quote these hymns to emphasize for the need of clean water for our masses:

अम्बयो यन्त्यध्वभिर्जामयो अध्वरीयतांम।
पृंच्वतीर्मधुना पयः।। **(I.-4.1)**

**"As mothers always bring happiness to their children, in the same manner.
The streams, nourishers of mankind, flow incessantly, adding milk and honey to their waters all the way".**

अप्स्वन्तरमृतंमप्सु भेषजम्।
अपामुत प्रशस्तिभिरश्वा भवथ वाजिनो गावो भवथ वाजिनीः **(I.-4.4)**

"O learned persons, may you know that there is ambrosia in the waters; there is healing balm in them, and there are medicinal herbs; know this, and by their proper use become vigorous like horses and kine."

शिवेन मा चक्षुषा पश्यतापचमतबमदज शिवया तन्वोपस्पृशत त्वचं मे।
घृतक्ष्चुतः शुचयो यां: पावकास्ता न आपः शं स्योना भवन्तु।। **(I.-33.4)**

"O elemental waters, may you behold me with an auspicious glance; may you touch my skin with your body. Dripping luster, glittering here and that are purifying, may those elemental waters be gracious and pleasing to us".

ये किमयः पर्वतेषु वनेष्वोषधीषु पशुष्वप्स्वन्तः
ये अस्मांक तन्वमाविविशुः सर्व तद्धन्मि जनिम किमीणाम्।।**(II.-33.5)**

"The worms, that are found in the hilly regions, in the forests, inside the animals 'and in waters, and that have entered' our bodies, I hereby destroy their entire generation".

इमा आपः प्र भराम्ययक्ष्मा यक्ष्मनाशनीः।
गृहानुप प्र सीदाप्यमृतेन सहाग्निना।।**(III.-12.9)**

"I bring her these waters, free from wasteful disease.(consumption)- and destroyers of the wasteful disease. I enter these houses with .the-, never-dying fire".

Its life-giving and healing qualities are evident from the following description in Rajanirghanta (300 AD) *"The qualities of Ganga water are: Coolness, sweetness, transparency, high tonic property, wholesomeness, potability, ability to remove evils, ability to resuscitate from swoon caused by dehydration, digestive property and ability to retain wisdom*":

अस्या जलस्य गुणाः शीतत्वम्, स्वादुत्वम, स्वछत्वम, अत्यन्तरुच्यत्वम्, पथ्तत्वम्, पावनत्वम्, पापहारित्वम्, तृष्णामोहध्वंसत्वम्, दीपनत्वम्, प्रज्ञाधारित्वंच, इति राजनिर्घण्टः

Scriptures cautioned against misusing the Ganga river. For instance, thirteen types of human actions: (1) defecation, (2) gargling, (3) throwing of used floral offerings, (4) rubbing of filth, (5) flowing bodies (human or animal), (6) frolicking; (7) acceptance of donations; (8) obscenity; (9) considering other shrines to be superior, (10) praising other shrines, (11) discarding garments; (12) bathing, and (13) making noise were prohibited.

The Committee, therefore strongly recommend for working on a mission mode by all the concerned Government Ministries/Departments/Organisations of the Union and State Governments so as to ensure clean water free from all pollutants such as arsenic, fluoride, salinity, heavy metals (Lead, Cadmium, Zinc,

Mercury), pesticides, etc. for our large population. On water conservation, the Committee may like to emphasize that every drop of water saved is the water produced and as such all the desired initiatives, which include recharging of under-ground water sources; enhancing storage capacity both above and below ground; giving emphasis on storage of rain water; incentivizing water efficient technologies; efficiencies of irrigation systems; plugging leakages; etc. should be taken with a sense of urgency. Further for achieving water use efficiency, free water should be provided upto a limit for all the sectors. Above all there is a need for sensitizing the people at large about the alarming situation with regard to water so as to involve them in the Mission.

National Mission for Green India

23. The Committee note that the National Mission for Green India aims at protecting, restoring and enhancing India's diminishing forest cover and responding to climate change by a combination of adaptation and mitigation measures. It envisages a holistic view of greening and focuses on multiple ecosystem services, especially, biodiversity, water, biomass, preserving mangroves, wetlands, critical habitats etc. along with carbon sequestration as a co-benefit. ₹2,000 crores for implementation of various activities under the mission for 12th plan has been approved by the Cabinet. The Committee also note that the mission seeks to increase forest cover to the extent of 5 million hectare and improve quality of forests on another 5 million ha and also to improve forest based livelihood income of about 3 million households. Further, enhanced annual CO_2 sequestration by 50 to 60 million tonnes in the year 2020 is also an objective. The scheme is proposed for a period of 10 years with an outlay of ₹60,000 crore. The Committee find that during FY 2017-18 ₹47.80 crore has been allocated for the scheme which is grossly insufficient as the committed liability for FY 2015-16 and 2016-17 is ₹89.53 crore which is much more than the budget allocated. The Committee, therefore, recommend that adequate financial allocation be made for the mission so that the activities of the mission are carried out more efficiently.

24. The Committee note that plantation activity is one of the key aspects of the mission. During the FY 2015-16 plantation activity was carried out in 32451.72

hectare area in four States of Chhattisgarh, Odisha, Manipur and Karnataka in forest and non-forest lands. Plantation was carried out in Punjab also in the FY 2016-17. The Committee, however, are of the view that though plantation activity is aimed at increasing green cover, they cannot replace actual forest cover. Forest has plants and trees of numerous varieties and sizes and shapes. Forests grow naturally and according to climate conditions existing in the area. Afforestation exercises are aimed at increasing tree count and there is no consideration to existing soil and weather conditions. As a result trees like eucalyptus are planted which make environmental problems worse rather than solving it. Planting of unsuitable trees may cause drought, and prevent bio-diversity in the regions. The Committee, therefore, recommend that while planting trees and increasing forest cover under the mission, adequate consideration should be given to the climate and soil and only trees that are native/suitable to the area should be planted.

25. The Committee note that India has made the target of sequestering 2.523 billion tonnes of carbon by 2020-30. As per experts, our current forest cover is 75 million hectare and for meeting our targets of carbon sequestration, 30 million more hectare land for forests would be required. The mission document does not make it clear as to from where this land is going to be arranged. As noted before, till 2016-17 afforestation programme targeted to cover only 51387 hectare which is a tiny proportion of what is needed. The Committee, therefore, are of the opinion that a holistic approach to increasing green cover and protecting existing trees is needed. The Committee feel that all aspects of urban and regional planning including architectural and other sciences have to work on the premise that trees are critical to our survival and they have to be protected at all costs. Similarly, protection of trees and forests are also linked to the protection of people who are dependent on forest produces for their livelihood. Unless interests of these people are protected by making appropriate changes in the law/policy, no amount of plantation exercise will succeed. The Committee, therefore, recommend that the mission should incorporate human as well as physical elements in its programme formulation and implementation.

National Mission on Sustainable Habitat (NMSH)

26. The Committee note that the National Mission on Sustainable Habitat (NMSH) aims at promoting sustainability of habitats though improvements in energy efficiency in buildings, urban planning, improved management of solid and liquid waste including recycling and power generation, modal shift towards public transport and conservation. The Committee find that major components of the mission are, improvements in energy efficiency in buildings through extension of energy conservation building code, better urban planning and modal shift to public transport, improved solid, liquid waste management in urban areas, improved ability of habitats to adapt to climate change by improving resilience in infrastructure, community based disaster management and measures for advance warning system for extreme weather events and conservation through appropriate changes in legal and regulatory framework. The objectives of the mission are being met through schemes such as Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Swachh Bharat Mission, Smart Cities Mission and Urban Transport Programme. By the year 2021, these four schemes will result in mitigating GHG emission of 133 million tonnes and by the year 2031, the mitigation will be to the tune of 270 million tonnes. The Committee find that the emphasis of the mission is limited to urban habitats only. There is no attention to rural habitats. As the population of the Country increases, there will be expansion of cities with villages subsumed within the cities. If the integrated plan under the mission does not take into account the requirements of the rural habitats, the problem would not be fully addressed. The Committee are of the view that mission on sustainable habitat has to see the habitat landscape in totality, only then sustainable solutions are possible. The Committee, therefore, recommend that the mission should introduce a comprehensive and integrated planning encompassing the needs of both rural as well as urban habitats. The Committee may be apprised of the steps taken in this regard.

27. The Committee note that the mission envisages improvements in energy efficiency in buildings through extension of the energy conservation building code - which addresses the design of new and large commercial buildings to

optimize their energy demand. The Committee are of the view that energy conservation building code talks about important things about energy efficiency of large buildings such as use of natural light and air for reduced energy requirements. The main issue, however, is the enforceability of the building code. Enforcing changes in construction through imposition of codes may also result in resistance from the people. Moreover, the Committee are of the view that as an ancient civilization, our Country has traditional house building knowledge and technology which are more suited for our needs. All the habitats whether in desert habitat, mountain habitat or plain areas, people have traditional building system designed for comfortable living and maximum use of natural resources like air and water and locally available materials. Blindly following western technologies and using cement and concrete in different habitats result in buildings requiring intensive energy. Therefore, building designs in new cities should be environment friendly, energy friendly and water friendly. The construction of residential/commercial buildings should be in a way that enables proper cross ventilation and natural light which would reduce the use of energy. The Committee, therefore, recommend to formulate building code and guidelines of the Mission which maximizes use of traditional knowledge and building material in buildings, minimize cutting of trees besides promoting our traditional construction technologies through institutions like CAPART, HUDCO etc.

28. The Committee note that at present 30 percent population of the Country lives in urban areas which is expected to grow to 40 percent by 2021 and 50 percent by 2050. The number of motor vehicles on our roads was 52.37 million in 2000 which increased to 121.63 million in 2011. The Committee note that India is poised for rapid economic growth. Such future growth will largely come from economic activities in urban areas as cities today contribute nearly 65 percent of India's GDP. With increasing urban sprawl, it is estimated that by 2030, this figure would reach nearly 70 percent. Nonetheless, economic activities would largely depend on mobility of the people dwelling in urban areas. Hence, development of cities through prioritizing urban transport is a step forward in this direction. Urban Transport is a key urban service that imparts efficiency to the city by

providing mobility to the workforce and hence best productivity. However, the huge number of vehicles on roads is also leading to congestion and pollution. The number of motor vehicles on our roads was 52.37 million in 2000 which increased to 121.63 million in 2011. The total number of registered motor vehicles in India was 210.02 million as on 31.03.2015. As a result of rapid increase in motor vehicles, congestion on the road is increasing leading to stress to the commuters and spike in air pollution. One of the objectives of the mission is better urban planning and modal shift to public transport and making long term transport plan to facilitate the growth of medium and small cities in such a way that ensures efficient and convenient public transport.

The Committee note that the Government is implementing AMRUT scheme (Atal Mission for Rejuvenation and Urban Transformation) and Smart Cities mission under the Sustainable Habitat Mission. AMRUT *inter alia* aims at reducing pollution by switching to public transport or providing facilities for non-motorised transport whereas the aim of Smart Cities mission is to provide basic infrastructure through convergence with other schemes in selected 100 cities. The Government is also encouraging public transport through financing of buses and BUS Rapid Transit System (BRTS) and Jawaharlal Nehru National Urban Renewal Mission (JnNURM). Metro Rail Projects are being implemented in 13 cities of the Country. The Committee are of the view that schemes such as AMRUT and Smart Cities Mission are effective schemes for promoting public transport but their horizontal coverage is very small. Such schemes need to be expanded to other cities also so that the problem could be resolved before it is too late. Similarly, the metro rail services should be expanded to all cities which have a population of more than a million. The Committee also recommend that in major cities multiple modes of transport such as local trains, trams should also be promoted. Besides, attention needs to be paid to switching over to clean energy for running our vehicles, i.e., cars and buses. Manufacture/use of electric cars needs to be incentivized besides giving attention to the infrastructure/ services needed like electrical recharging stations. Not only that R&D in solar driven transport like cars and buses should be given more emphasis so as to find solar solutions for our transport. For covering small distances, dedicated cycle

tracks need to be constructed. The satellite cities should be linked with the nodal city through rapid transport system to avoid congestion in the city centres. All the initiatives being taken in this regard need to be further emphasized, which certainly would reduce our dependence on diesel/petrol thereby saving money and addressing the issue of pollution particularly in big cities and metros.

29. The Committee note that Swachh Bharat Mission-Urban (SBM-U) was launched on 2nd October 2014 with the objective of *inter alia* elimination of open defecation, modern and scientific municipal solid waste management and capacity augmentation for Urban Local Bodies to be achieved in five years, i.e. 2nd October 2019. It also targeted to achieve 100 percent door-to-door collection and scientific management of municipal solid waste. The Committee feel that solid waste is one of the major components of urban pollution. The Committee note that a number of policy initiatives have been taken to encourage processing of waste to compost and waste to energy, mandatory use of plastics in road construction, and mandatory use of recycled construction and demolition waste in all construction projects. The Committee feel that waste to compost and waste to energy are very important for creation of sustainable habitats. The Committee find that 145 compost plants are currently functional in the Country while 150 plants are under construction. After construction of these plants,the total compost production will increase from 13.13 lakh tonnes to 33 lakh tonnes. The Committee recommend that the under construction plants should be expeditiously constructed and more cities should be brought under waste to compost plan. The Committee note that 511 MW of power can be produced from municipal solid waste. Currently seven plants are operational and 53 are being constructed. The Committee recommend that the construction of waste to energy plants should be closely monitored so that these plants are constructed without any delay. The Committee are concerned that there is no proper segregation of wastes before they are dumped on the dumpsites. With the increasing electronic waste, hospital waste content among waste, there is serious danger of emission of poisonous gases and diseases spreading from the dumpsites. The Committee, therefore, recommend that there should be proper segregation of waste at the source itself for which public awareness campaign is needed.

30. The Committee in their 15th Report (16th Lok Sabha) had recommended to make suitable provision under 'Namami Gange' to provide bio-digester toilets in all the villages and towns on the banks of Ganga and its tributaries in a time bound manner. The Committee while taking note of the fact that human excreta if buried in soil, converts into manure and if discharged in the water, poisons the water, would like to reiterate their recommendation and would urge the Government to act in a time bound manner.

31. As regards plastic waste, it is estimated that 15000 tonnes of plastic waste is generated every day in the Country. The plastic waste problem in urban areas has reached alarming proportions while the problem has also spread in rural areas, where, due to absence of any institution tasked for removing garbage, it is posing significant environmental and health challenges. As per data, 60 percent of all plastics in the Country is currently recycled, leaving 40 percent or 6000 tonnes/day being disposed in an unsafe manner. In urban as well as rural areas, there is no effective mechanism to segregate plastic waste, leading to compounding of problem as different plastic has different decomposition rates. In cities, there is another problem where disposable plates, glasses, etc. made of plastic/non-degradable materials are increasingly being used. Although plastic has been banned in several States, its implementation has left much to be desired. Increasing use of plastic bottles and bags in vulnerable mountain ecosystems cause environmental degradation in areas which are already stressed. The Committee, therefore, recommend that institutional mechanism may be set up in all the States to monitor the use of plastics, besides ensuring its proper segregation, recycling and disposal. While banning the use of plastic carry bags, bottles etc., it is utmost important to find the biodegradable alternatives through R&D. Above all, adequate steps need to be taken to spread awareness among people about the importance of proper segregation of plastic waste and avoiding the use of disposable materials to the maximum extent possible.

32. The Committee note that the National Mission on Sustainable Habitat is of critical importance to make our habitats - both urban and rural better, livable and

with minimal carbon footprint. To make it possible, an integrated approach to resolving existing issues of pollution, congestion and environmental degradation is needed. This also requires people's participation. Private sector participation is also important as the need for funding may not be fulfilled by the Government alone. However, the people are most important element of this programme and without their active participation, the programme will not succeed. Adequate steps to encourage people's participation and involvement of private sector in the programme should, therefore, be taken.

National Mission for Sustainable Agriculture

33. The Committee note that the mission aims at enhancing food security and protection of resources such as land, water, biodiversity and genetics, through developing strategies to make Indian agriculture more resilient to climate change such as development of new crop varieties resistant to thermal, fire, drought etc. The mission focuses on natural resource management, water use efficiency, horticulture, crop sector, seed, pest, disease and weed management, soil health management, farm mechanisation, conservation, precision farming, agriculture-supply chain management, safety net, credit, access to information, research & development, capacity building and livestock and fisheries. Although the mission document mentions different aspects of agriculture, the crucial element of giving income security to farmers is missing. The crop insurance scheme and the MSP scheme implemented by the Government is not able to make farming remunerative for farmers. The Committee recommend that these elements be taken into consideration by the Government and they be apprised of the steps taken in this regard.

34. The Committee note that one component of the mission is soil health management through promoting organic farming. Farming with the aid of chemical fertilizers is one of the contributor of climate change. Such farming also causes degradation of soil, water as well as farmers. The Committee have been informed that although per capita consumption of pesticides is lowest in India (at 0.6kg/ha), many pesticides are applied without following the minimal safety measures leading to health risks, soil water and air pollution. Further, the usage

of pesticides is highly concentrated in irrigated cultivation zones of the Country. The Committee also note that among other things, the mission has brought 18.70 lakh hectare of area under organic farming. The Committee have been informed that organic farming has been taken up at a large scale in various States of the country, most notably in Andhra Pradesh. Besides, as reported in the media, Sikkim became India's first 100 percent organic State in January, 2016. The Committee feel that organic farming needs to be further encouraged as chemical fertilizer based farming contribute 50 percent of the green house gases (GHG). Organic farming can provide 100 percent solution to the build up of GHG in the atmosphere and use of organic matter also increases the water retention capacity of the soil. The Committee have also taken note of the fact that the productivity in organic farming is not less than that achieved through chemical farming. Moreover, the Committee have been informed that under Paramparagat Krishi Vikas Yojana (PKVY), a subsidy of ₹25,000 per hectare is given to the farmers to support them for moving from inorganic to organic farming over a period of three years. However, it is not a subsidy on par with that given for chemical fertilizers. The Committee feel that this amount is not sufficient and needs to be suitably increased to give more incentive to organic farmers. Similarly, the subsidy given on chemical fertilizers need to be progressively decreased as such a subsidy is like providing incentives for soil, health and climate degradation. The Committee have also noted that the Department of Fertilizers is encouraging use of city compost by providing Market Development Assistance of ₹1500/metric tonne. This amount also needs to be increased. The Committee also recommend that immediate steps be taken to increase the coverage under organic farming in all the States.

35. The Committee in their 22nd Report (16th Lok Sabha) had recommended that the Government should come out with a comprehensive and well defined strategy on organic farming to which the Government in the action taken note had stated that the comprehensive definition will be adopted in the policy on organic farming/organic farm produce. The Committee would again like to emphasise to bring uniformity in the meaning and definition of 'Organic Farming/Organic Farm Produce' to avoid any legal hurdle in domestic consumption and international

trade promotion and would urge the Government to take immediate and urgent action in this regard.

36. The Committee note that India supports 15 percent of the world's population, but has only 4 percent of the world's water resources. The data also shows that only 35 percent of India's agricultural land is irrigated. This means that a huge 65 percent of farming depends totally on rain. Not much has been done to conserve water for off-season use. Even after constructing 4,525 large and small dams, the country has managed to create per capita storage of only 213 cubic meters - compared to 6,103 cubic m per capita in Russia, 4,733 in Australia, 1,964 in the United States, and 1,111 in China. India's water crisis stems from the fact that it is highly dependent on a few major river systems, especially the Ganges and its tributaries, for its water supply. But India use almost twice the amount of water to grow crops as compared to China and United States. Main reasons for this are power subsidies for agriculture leading to decline in water levels and also the policy to give price support to water intensive crops such as sugarcane, wheat and rice. As a result these crops are being grown even in those areas with the use of groundwater and chemical fertilizers where geographical conditions for these crops are not appropriate. Moreover, new hybrid seeds give more yield but they also need more water. As a result the traditional farming systems and practices have been obliterated because there is no Government support or income support to farmers for them. India's agricultural sector currently accounts for over 90 percent of total water drawn, but contributes only 15 percent to the country's GDP. As a result of Government's policy to provide free water and power to farmers, crops such as rice are being grown in semi-arid areas of Punjab and Haryana and sugarcane is being grown in dry areas of Maharashtra. The Committee are concerned that such heavy use of groundwater is causing steep decline of groundwater levels in many States and the country is moving towards becoming a water scarce Country. The Committee, therefore, recommend that the Government should formulate appropriate policy measures for promoting efficient irrigation methods such as drip irrigation, sprinkler systems for irrigation. Moreover, water efficient crop varieties should be developed through R&D in our research institutions such as ICAR.

37. The Committee feel that the Mission lacks in giving focus to the farmers while taking initiatives for sustainable agriculture. Agriculture as a sustainable occupation can survive only after the farmers are given chance to sustain themselves. For this, they need to have access to better seeds, best practices in farming and support from the Government to cover farming risk. In this regard, the Pradhan Mantri Fasal Bima Yojana (PMFBY) was launched by the Government in 2016. It is a yield-based insurance that uses crop-cutting experiments (CCEs) to determine the yield lost by farmers due to natural catastrophes and adverse weather conditions. The yield obtained through the CCE's determine the payout made by the insurance firm to the farmer. The PMFBY improves on other existing schemes by removing caps on the premiums and making use of modern technology. However, the Committee also note that the scheme suffers from several problems such as the delay in crop cutting experiments and its associated high costs, delayed/non-payment of insurance claims to farmers and lack of transparency. As a result, farmers lose interest in the crop insurance schemes. Another problem relating to crop insurance schemes in India is coverage. The PMFBY states that overall area insured has decreased over the last 2 years (from 53.7 million hectare in 2015-16 and 57.2 million hectare in 2016-17 to 47.5 million hectare in 2017-18). This is less than 24 percent of the gross cropped area (against a target of 40percent) as compared to 89 percent in the US and 69 percent in China. There is another insurance scheme which is called Weather Based Crop Insurance Scheme (WBCIS) which aims to mitigate the hardship of the insured farmers against the likelihood of financial loss on account of anticipated crop loss resulting from weather conditions including fluctuation in rainfall, temperature, wind, humidity etc. This scheme seeks to provide insurance claim to farmers on the basis of observed weather data that are directly relevant to the agriculture. The problem with this scheme is that number of automatic weather stations in the Country is very less. As against the requirement of 33000 AWS, there are only 706 AWS operational currently. In spite of its advantages, the coverage under WBICS has declined from 11.25 million in 2014-15 to a little over 2.1 million in 2016-17. In order to increase coverage, it is necessary for the Government to effectively communicate to the farmers the value of insurance

products. Also, adequate financial investment for installation for more AWS is needed. The Committee, therefore, recommend that adequate financial allocation should be made so that the crop insurance schemes attract participation from greater number of farmers. The Committee also recommend that agricultural insurance scheme should be re-formulated in order to suit the needs of farmers who engage in organic farming. Multi-cropping system also which is the very basis of organic farming should also be included under the insurance schemes.

38. The Committee observe that India had the culture of saving part of the crops as seeds but over the years this traditional system has been taken over by a big market of seeds where MNCs are selling their seeds at high prices thereby increasing the cost of agriculture. Not only that seeds sold by MNCs are often untested in local conditions, consume more water and are vulnerable to failures. The Committee further note that our country has rich variety of indigenous seeds and traditional Indian system of water and agriculture seeds which need to be encouraged to address the issue of availability and quality of seeds. The use of our traditional system besides being eco-friendly would reduce the input cost by saving money spent on purchasing seeds and saving of water. The traditional seeds which were climate resilient and less water guzzling should, therefore, be traced, developed and preserved.

39. The Committee note from a media report that NITI Aayog has recently urged to all the States to work towards giving practical shape to the Zero Budget Natural Farming (ZBNF) on the lines of Himachal Pradesh and Andhra Pradesh, for which the Aayog will provide all assistance. Zero Budget Natural Farming system has been stated to have the advantages which include saving of water, protecting the environment, increase in the fertility of land and under this system the cost of production becomes zero and products are non-poisonous. While appreciating the move of the NITI Aayog to give emphasis to traditional ways of farming, the Committee would like the Government to furnish the details of the aforesaid model and plans to implement ZBNF system by various States/UTs .

40. As stated in Economic Survey (2017-18) , according to a 2014 study by the Indian Agricultural Research Institute (IARI), in 2008-09 the country generated 620

million tonnes of crop residue, of which around 16 per cent was burnt on farms, of which 60 per cent was paddy, straw, whereas wheat accounted for just 22 per cent. As per estimates, Punjab alone produces 19-20 million tonnes of paddy straw and about 20 million tonnes of what straw. About 85-90 percent of this paddy straw is burnt in the field, and, as the satellite images show, wheat straw is also increasingly being burnt in recent years. As per IARI report main reasons for burning crop residues in field include unavailability of labour, high cost in removing the residues and use of combines in rice-wheat cropping system especially in the Indo-Gangetic plains (IGP). The usage of combine harvesting machines is another reason because it only reaps the grains, leaving stalks or stubble of around 40 cm. Removing the stubble manually or by using specialised machines to do the job is costly. For every 0.4 ha of wheat crop, the cost of renting a combine harvester is just ₹800. Once the machine has harvested, the cost of getting the stubble removed is ₹3,500/ha. So the value of fodder is discounted because it is more economic for the farmers to just burn by using match box and clear the fields.

The Committee understand that crop residue burning has been banned by the National Green Tribunal (NGT) in States of Rajasthan, Uttar Pradesh, Haryana and Punjab parts of which constitute the National Capital Region, and in 2014, the Union Government had released the National Policy for Management of Crop Residue, which NGT directed the States to implement. Besides crop residue burning is punishable under the Air (Prevention and Control of Pollution) Act, 1981. In spite of all these provisions, the problem of crop residue burning persists. Burning of crop residues leads to release of soot particles and smoke in the atmosphere causing human and animal health problems. It also leads to emission of greenhouse gases, namely carbon dioxide, carbon monoxide, methane and nitrous oxide, causing global warming. These gases are of major concern for their global impact and also their local impact in causing rise in suspended particulate matter (SPM) in the nearby areas leading to health hazard. While appreciating banning burning of crop residue in States constituting NCR by NGT, the Committee observe that there is a need for consultation with the farmers and understanding their problems. The farmers should be incentivized for use of

specialized machines which cut the crop residue from the bottom or removing the stubble manually without resorting to crop residue burning. Besides technological solutions are to be found under a time bound programme and Agriculture Engineering Departments should be incentivized to provide early cost effective alternatives for burning of crop residue.

National Mission on Sustaining Himalayan Ecosystem (NMSHE)

41. The Committee note that the objective of NMSHE is to build S&T capacity to address sustenance of Himalayan ecosystem. To achieve its objective, the mission aims to understand the complex processes affecting Himalayan Eco-system and evolve suitable management and policy measures for sustaining and safeguarding the Himalayan Ecosystem, assess the health status of the Himalayan ecosystem for policy formulation functions and assist states in the Indian Himalayan Region for implementation of actions for sustainable development. The Committee also note that under the mission, a Centre of Glaciology at Wadia Institute of Himalayan Geology, Dehradun has been set up. Moreover, 6 thematic task forces have been set up for detailed study of health status of Himalayan ecosystem and climate change centres in 11 out of 12 states. The task forces have been assigned to establish databases, design monitoring systems, developing modeling and simulations, undertaking vulnerability assessment, adaptation policy research and pilot studies for revalidation. Therefore, the focus of the mission is on creating infrastructure for understanding the Himalayan ecosystem. The Committee feel that any mission for gaining detailed knowledge about Himalayan ecosystem should not be confined to just one part of the Himalayan ecosystem. Himalaya is an international ecosystem encompassing countries such as Afghanistan, Pakistan, China, Bhutan, Nepal, Myanmar, Bangladesh, Vietnam in addition to India. The Committee feel that any effective action for sustenance of Himalayan ecosystem can be meaningful only if it covers all parts of Himalaya and for this reason such centres need to be opened in other countries also which are a part of Himalayan ecosystem. To make this happen, consultations with those countries need to be

undertaken and Climate Change centres of all these countries should work in tandem.

42. The Committee note that the assigned task to one of the thematic task forces is to compile traditional knowledge existing in the Himalayan region. The key objective of the programme is to develop a sound database on the Traditional Knowledge System (TKS) on the Indian Himalayan Region (IHR). The Committee also note that more than 170 out of total 701 indigenous groups of India inhabit the IHR and are repository of vast array of traditional knowledge. Further 50 groups have been identified for documenting TKS. The Committee further note that data has been created on different aspects of a variety of traditional farming systems, local innovative farming practices and natural resource based livelihood earning traditions of the identified communities. A number of community based organisations are also engaged in documentation of TKS at local level in the region. The Committee are of the view that preserving, documenting and compiling traditional knowledge in the Himalayan region is very important task as our existing education system does not lay adequate emphasis on traditional knowledge and there is a real danger of this knowledge disappearing. Moreover, traditional knowledge pertaining to farming, building houses, tackling weather extremities are of direct relevance in our fight against climate change as they are low energy low carbon solutions which we may apply today also with minimal changes. The Committee, therefore, recommend that the work relating to TKS should be expeditiously compiled and after compilation, they should be widely publicized and made a part of school and college curriculum.

43. The Committee are of the view that reckless and irresponsible tourism in the Himalayan Ecosystem is one of the major reasons for environmental degradation there. With the construction of roads and luxurious amenities for the tourists, the number of people visiting the Himalayan region have vastly increased which is increasing the pressure on the ecosystem. As a result of large number of visitors, the roads, the houses, the hotels and resorts - all of these have to be constructed by cutting mountains. Many of these constructions are not as per specification for mountains but are more inspired by plain areas.

Moreover, the tourists visiting these areas are not sensitized to responsible and sustainable tourism and indulge in littering with plastic bottles and other non-biodegradable materials. The Committee, therefore, recommend, that public awareness campaigns for sensitizing people about vulnerability of Himalayan region and need for sustainable tourism may be undertaken by the Government.

44. The Committee, vide para 1 of the this part, have noted that glaciers in the Himalayan region are retreating at an alarming rate. As per media reports, due to glacial retreat, Himalayan region has lost 13percent of its glaciers in last four decades resulting in loss of 443 billion tonnes (Gt) glacial ice. The rate of retreat of glaciers in the region, which varies from glacier to glacier, ranges from a few metres to almost 61 m/year. If the same rate continues, it is apprehended that the glaciers are likely to disappear by the year 2035. It is also reported that the rate of glacial loss in the Himalayas has accelerated over the decades, from around 9 Gt/year in 1975-85 to 20 Gt/year in 2000-2010. Glaciers are reported to be retreating faster in Western Himalaya than in Sikkim. The effect of glacial retreat and their eventual disappearance will change the weather pattern and be catastrophic for the entire region affecting crop cycles, economic development, health, water availability, weather etc. The Committee, therefore, recommend that adequate financial allocation be made and adequate infrastructure be created for extensive study of the Himalayan ecosystem to measure the retreat of all the glaciers existing in the region and the ways to mitigate its effects. Besides there is a need to regulate Himalayan Eco-tourism. A Committee comprising of experts to formulate the guidelines, to be observed while preparing the roadmap for Himalayan Eco-tourism, should be constituted. The guidelines should be designed keeping in view the entire Himalayan range from West to East. Urgent steps are required to create a mechanism involving all the stakeholders who are directly or indirectly affected by the changes in Himalayan system so that integrated approach is adopted in the entire Himalayan area. Such a platform will need international cooperation from all the countries falling in/connected to the Himalayan range.

National Mission on Strategic Knowledge for Climate Change

45. The Committee note that the National Mission on Strategic Knowledge for Climate Change (NMSKCC) seeks to build a vibrant and dynamic knowledge system that would inform and support national action for responding effectively to the objective of ecologically sustainable development. It aims at creating institutional capacity for research infrastructure including access to relevant data sets, technologies, computing and communication facilities and awareness to improve the quality and sector specific scenarios of climate change over the Indian subcontinent. It also seeks to build knowledge and research networks, develop national capacity for modeling the regional impact of climate change on different ecological zones within the country for different seasons and living standards. The mission seeks to form well designed knowledge networks with a well structured framework for harmonization, interoperability, sharing and exchange of data of relevance to climate change and responses, to enhance the research capability in climate science, position a technology watch system for key sectors related to economic development, likely to be affected by climate change, leverage development of suitable technologies for adaptation and mitigation of climate change under various missions, assist other agencies engaged in the implementation of the National Action Plan on Climate Change and supporting the actions under the other Missions, if necessary. So far, 12 thematic knowledge networks have been established, 3 regional climate models have been developed and 75 high quality climate change professionals have been trained. The Committee have noted that India's share in global climate change research publication is less than 2 percent and we are behind countries like USA, UK, Germany and China. The Committee feel that climate change as an academic discipline is largely absent from our colleges and universities and that is why there is absence of trained manpower in the field. The objective of the mission for building national S&T capacity in climate change research to develop strategic knowledge system can be achieved only when climate change as a subject is introduced in colleges and universities. The Committee, therefore, recommend for taking the desired action alongwith adequate financial allocation for the purpose.

46. The Committee note that there are 3000 scientists and 450 institutions in the Country in so far as climate science is concerned. For a Country of a size of India, this is a very small number. Moreover, the research efforts in the climate science are fragmented and there is no coordination in research being undertaken in different institutions. The Committee also note that there is weak linkage between climate science and policy and there is no partnership with private sector and the civil society. The Committee recommend that steps be taken to interlink all the institutions engaged in climate science research and also involve private sector in climate science research through fiscal and other incentives. Involvement of rural population is also necessary to collect the real time data.

47. The Committee note that the mission seeks to build knowledge and research networks, develop national capacity for modeling the regional impact of climate change on different ecological zones within the country for different seasons. The Committee also note that India does not have an independent data base for climate science research and has to depend on foreign sources for them. The Committee are of the view that dependence on foreign sources is not healthy as their database has been built and compiled for their requirements which may not be similar to us. The Committee, therefore, recommend that efforts be made to develop our independent database commensurate with our needs. For example, we should be able to develop models for monsoon dynamics and regional climate model which are relevant to our eco-system. Action in this regard is urgently called for as the study of climate is a continuous process and provides the necessary information for policy formulation.

48. Climate change is one of the largest and most complex problems we are facing today. The impacts of higher temperatures, variable precipitation, and extreme weather events have already begun to impact the economic performance of countries and the lives and livelihoods of millions of poor people. India is among the countries most vulnerable to climate change. It has one of the highest densities of economic activity in the world, and a very large number of poor people who rely on the natural resource base for their livelihoods, with a high

dependence on natural environment, specially rainfall. The Climate change will affect us through vagaries of weather, incidences of floods and droughts, changes in rainfall patterns, melting of glaciers, effect on groundwater, rise in sea level, food security, energy security, water security, health and increasing conflicts due to increasing stress. The near universal impact of climate change makes effective remedial actions urgent. As a number of agencies are expected to work together to deal with this crisis like situation, the action needs to be urgent, integrated, coordinated, collaborative, collective and effective global, national and local harnessing the energy of all citizens.

49. To conclude, Climate Change issues cannot be resolved with a fragmented approach. They require holistic solution. Any one aspect of environmental change quickly interacts with other components. A slight increase in global warming affects climate, agriculture, health, water (river and underground), life on coastal regions, urban habitats and so on. The Committee strongly recommend to take a holistic view of the existential problem and find holistic solutions with great urgency. The Committee recommend to constitute a Mission Mode Authority with Prime Minister to preside and review all the efforts. The Authority should include representatives of all the Missions and provide a holistic approach for resolving the climate issues. The recent cataclysmic happenings spread over from Uttarakhand to Kerala are the nature's warning bells and the sound is too high in decibels to be ignored. The Committee recommend an urgent action on the part of the Government under a time-bound programme.

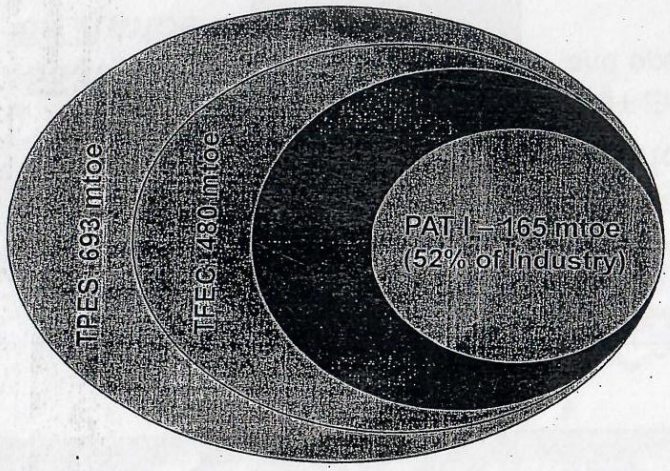
NEW DELHI;
10 December, 2018
19 Agrahayana, 1940 (Saka)

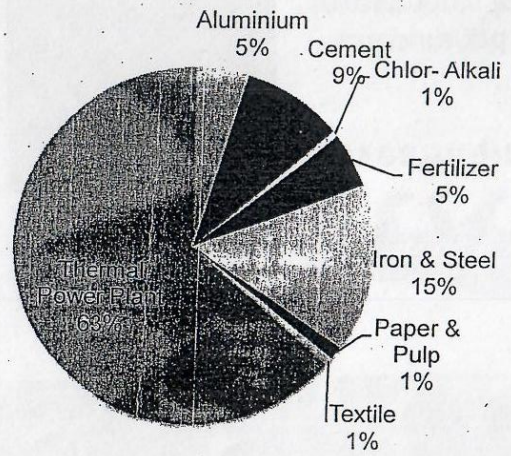
Dr. MURLI MANOHAR JOSHI,
CHAIRPERSON,
COMMITTEE ON ESTIMATES.

Appendix-I

सत्यमेव जयते

PAT 1 Coverage





TPES: Total Primary Energy Supply
TFEC: Total Final Energy Consumption
Industry includes Thermal Power Plants
mtoe: Million tonnes of Oil Equivalent

Baseline Year: 2010
Data Source: IEA and BEE

Appendix II

ENERGY IS LIFE
BEE
CONSERVE IT

GOVERNMENT OF INDIA
MINISTRY OF POWER

PAT SCHEME

Outcome – PAT 1

Energy Saving

5635 MW
8.67 mtoe

1.25% of India's total primary energy supply

Emission Reduction

31 Million tonnes of CO_2

1.93% of India's total emissions

Capacity building

5000+ Engineers and operators

13718 Energy Auditors & Managers

219 Accreditation

Savings

Saved due to energy consumption

Rs 9,500 Crores

Investment

MAKE IN INDIA

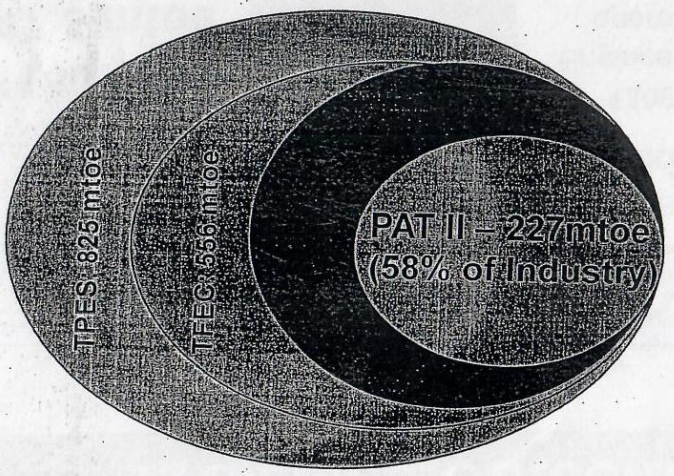
Encouraged investments for energy efficient technologies

Rs 24,517 Crore invested

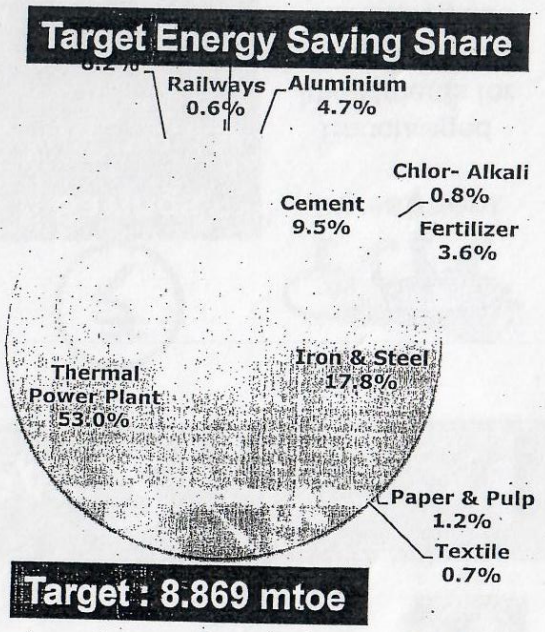
Appendix-III

सत्यमेव जयते

PAT 2 Coverage



TPES: Total Primary Energy Supply
TFEC: Total Final Energy Consumption
Industry includes Thermal Power Plants and Railways
mtoe: Million tonnes of Oil Equivalent



Baseline Year: 2014-15
Data Source: IEA and BEE

Appendix-IV

ENERGY IS LIFE
BEE
CONSERVE IT

GOVERNMENT OF INDIA
MINISTRY OF POWER

PAT SCHEME

Projected Outcome – PAT 2

Energy Saving

11407 MW
17.5 mtoe

2.09% of India's total primary energy supply

Emission Reduction

60 million tonnes of CO_2

3-4% of India's emissions

Capacity building

12000+ Engineers and operators

15000 Energy Auditors & Managers

500 Accreditation

Savings

Monetary savings due to energy

Rs 19100 Crores

Investment

Encouraged investments for energy efficient technologies

Rs 30,000 Crore (Projected)

Appendix-V

~~ANNEXURE II~~

SECTOR-WISE ACHIEVEMENTS, BEST PRACTICES AND TECHNOLOGY UP-GRADATION

1. **Achievements:** Sector-wise achievements are given in the following table.

Sr. No.	Sector	Minimum annual energy consumption for the DC (tonne of oil equivalent)	No. of DCs	Annual Energy Consumption (Million TOE)	Energy Reduction Target For PAT Cycle-1 (Million toe)	Achievements/ Savings (Million toe)
1	Aluminium	7500	10	7.71	0.456	0.73
2	Cement	30000	85	15.01	0.815	1.48
3	Chlor-Alkali	12000	22	0.88	0.054	0.09
4	Fertilizer	30000	29	8.2	0.478	0.78
5	Iron & Steel	30000	67	25.32	1.486	2.1
6	Pulp & Paper	30000	31	2.09	0.119	0.29
7	Textile	3000	90	1.2	0.066	0.13
8	Thermal Power Plant	30000	144	104.56	3.211	3.06
Total			478	165	6.68	8.67

2. Best Practices & Technology up gradation

1 ALUMINUM SECTOR

Some of the significant energy-efficient technologies & best practices adopted by Aluminium Sector's DCs are outlined below:

1. Implementation of slotted anode in pots
2. Reduction in Stub to Carbon voltage drop
3. Eco-contact to reduce voltage drop at conductor joints
4. Use of self-developed fuel "CRYSTAL" additive for dozing inside the furnace

In addition, to these technologies, operational behavioral changes were also observed. The plants opted for better operational practices like switching off cooling tower fans as per need, stoppage of driers in service air system, Interconnection of pump's, installation of efficient pumping system, modification of compressed air system, Captive Power Plant's Renovation &Modernization, optimization etc.

2. Cement Sector

1. Installation of Vertical Grinding Mill
2. Installation of High efficient screw compressor
3. Increasing the usage of Alternate Fuel in the Kiln.
4. Increasing the number of stages of preheater
5. Installation of High Efficiency 3rd Generation Air-Separator

3. Chlor Alkali Sector

Some of the important energy-efficient technologies & best practices adopted in Chlor- Alkali plants are outlined below:

1. Upgrading to 6th Generation/ Zero gap type Cell in Electrolyser.
2. Installation of Back pressure turbine to eliminate letdown from HP to LP steam and recover power.
3. Recovery of waste heat for process heat or power generation.
4. Feeding of 48% Caustic Soda Lye(CSL) at 90° C directly to Caustic Concentration Unit (CCU) from Caustic Evaporation Unit (CEU)
5. Installation of Vapor Absorption Machine (VAM) to recover heat from 48% CSL.
6. Optimization of Electrolysers for current consumption by monitoring cell voltages and replacing membranes in time
7. Heat recovery by Provision of Brine and Chlorine re-cuperator for pre-heating the feed brine towards the Cell.

4. Fertilizer Sector

During sixties and mid-seventies, fertilizer plants were based on raw materials readily available at that time i.e. electricity (for electrolysis), coke, naphtha, fuel oil etc. These older plants tried to fill in the technological gaps by incorporating revamps and retrofit measures, whichever were possible, in various phases.

Over a period, the fertilizer industry has adopted a large number of revamp technologies available for ammonia production such as

1. Radial-axial flow converters, additional heat recovery from furnace flue gases, additional purification of synthesis gas, use of more efficient catalyst, refurbishing or replacement of rotating machines including major compressors and turbines, better heat integration, vapour absorption refrigeration (VAR) to utilize low level heat to generate chilled water and using the same to reduce section temperature of air/process gas at suction of respective compressors.
2. In urea plants, a number of improvements include replacement of Urea Stripper with Bi-metallic Stripper, replacement of trays in Urea reactor with high efficiency trays, suction cooling of CO_2 Compressor, installation of Medium Pressure Pre-decomposer for recovering heat from vapors of

Decomposer, installation of Pre-concentrator before Vacuum Concentration Section, High Pressure Urea Hydrolyser etc.

5. Iron & Steel Sector

Some of the significant energy-efficient technologies & best practices adopted by Iron and Steel Sector's Designated Consumers are outlined below:

1. Use of 100% pellets as iron burden reduces coal consumption, improves better metallization of pellets, reduces fines generation and iron ore loss and improves work environment.

2. High top pressure blast furnaces also provide an ideal opportunity for recovering energy from the large volumes of pressurized top gas. TRT (Top Recovery turbine) can be used to generate electricity from this high top pressure.

3. Waste heat recovery from DRI (Direct Reduced Iron) process reduces massively the need for external fuel like coal for generates the same amount of electricity.

4. Direct Rolling of hot continuous cast billet to produce TMT (Thermo Mechanically Treated) bars and therefore, completely avoided uses of Furnace oil in reheating furnace.

5. The major benefit from Coke dry quenching (CDQ) is recovery of heat to produce steam & power which in terms also benefit the environment.

6. Pulp and Paper Sector

1. Chemical Pulp Mill: Lime Kiln Oxygen Enrichment, Carbon Dioxide Washing Aid, Digester Blow Heat Recovery System, Use of Pulping Aids to Improve Yields, Tertiary and Quaternary Combustion Air, Solid Fueled Lime Kiln
2. Mill Wide: Collect and Reuse Mill Hot Water, Use Variable Frequency Drive (VFD) on Motors with variable loads, Use EE Motors, Minimize Pressure Drops, Install and Use Real Time Energy Monitoring Systems, Capture White water Waste Heat to Pre-Heat Mill Water
3. Paper Machine: Use Dryers Bars and Stationary Siphons in Rimming Dryers, Use a Dryer Management System, Operate Pocket Ventilation between 180-195°F, Wet Dry End Broke Surge Tanks, Variable Speed Thick Stock Basis Weight Control, Paper Machine Hood Heat Recovery
4. Utility Plant: Black Liquor in Recovery Boiler, Modified soot blower Operation, Distributed Boiler Control System, Recover Heat from Boiler Blow down, Upgrade Boiler Burner
5. Others : Automatic Chip Handling and Thickness Screening, Recover Heat from Latency Chest vent, Install Mid-Consistency Drum Pulper, Secondary Fiber High Efficiency Pulper Rotor, Use Load Management in Refining

7. Textile Sector

1. Use of variable speed drives at all applicable motors/pumps.
2. Replacement of metallic blade fans with FRP blades, with optimized blade angle.
3. Approach for direct drive instead of belt drive.
4. Optimization of suction pressure of Pneumafil in open and ring frame.
5. Installation of energy efficient motor by replacing old/rewinded motors.
6. Replacement of Compact Florescent Lamp (CFL)/ High Pressure Sodium Vapor (HPSV) with Led lights.
7. Installation solar water heating arrangements for yarn conditioning machine.
8. Intermittent running of overhead blower wherever installed.

8. Thermal Power Plant Sector

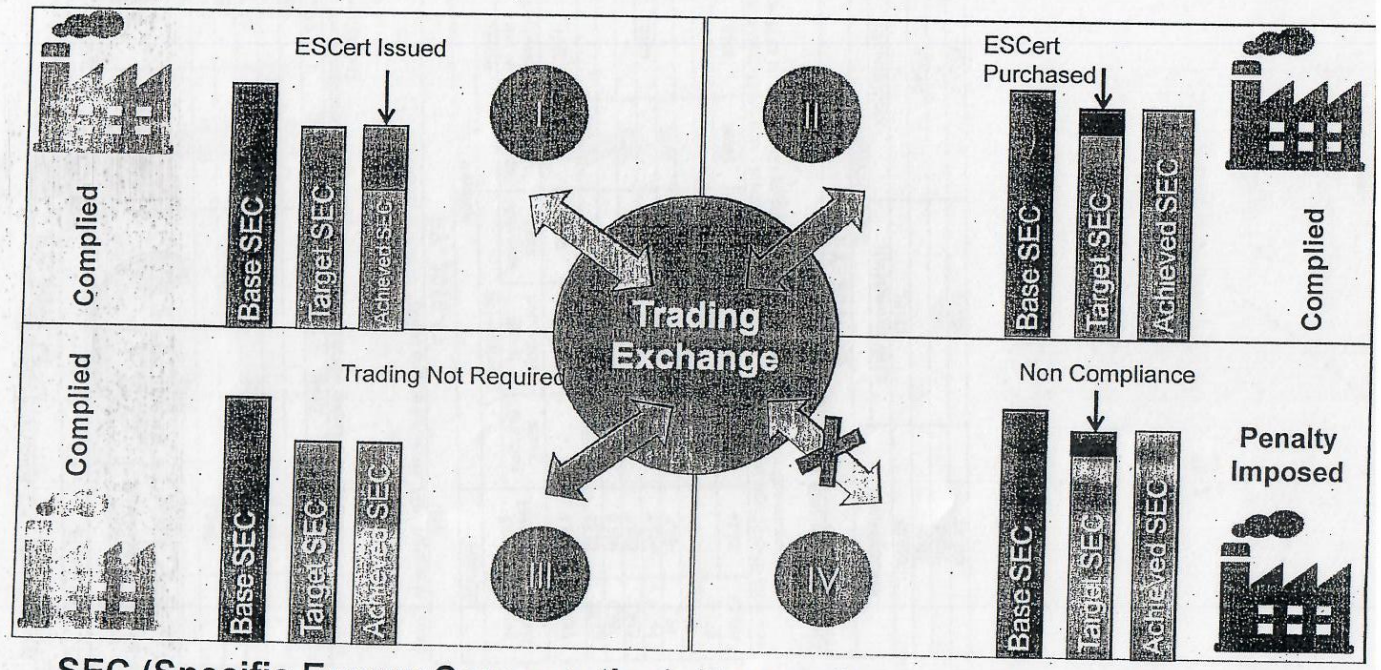
While most of the plants invested in least payback period option of saving in Auxiliary Power Consumption (APC) by changing to LED lamps, installation of variable frequency drives (VFDs) and stage reduction in pumps as per need, others realised the need for advanced technology. Some of the significant energy-efficient technologies & best practices adopted by Thermal Power Plant Sector's Designated Consumers are outlined below:

1. Use of washed coal
2. Dynamic coal balancing
3. Intelligent soot blowing system
4. Installation of Waste Heat Recovery (WHR) and Steam Turbine gas based plants
5. Installation of Vapour Absorption Machines(VAM)

Appendix VI

GOVERNMENT OF INDIA
MINISTRY OF POWER

PAT Mechanism



SEC (Specific Energy Consumption): Energy Consumed per unit production

Appendix-VII

(*Phy:* area in hectares, *Fin:* rupees in Crore)

Sl. No.	States	FY- 2015-16					
		Physical				Financial	
		Target		Achievement			
		Advance Work	No. of households	Advance Work	No. of households	Fund Released	Fund Utilized
1	Chhattisgarh	19128	5908	19128	5908	23.386	23.386
2	Karnataka	760	1002	760	1002	1.055	1.055
3	Kerala*	4978	12129	-	-	9.148	-
4	Manipur	9906	6653	8798	-	8.348	8.348
5	Odisha	2177.72	2500	2177.72	2500	1.829	1.829
6	Punjab*	3000	2703	-	-	6.115	-
7	Uttarakhand*	7483	6534	-	-	20.209	-
	Total	47432.72	37429	30863.72	9410	70.091	34.618

*Amounts released to Kerala, Punjab and Uttarakhand during the year 2015-16 could not be utilized in the year 2015-16 which was revalidated for utilization during the year 2016-17.

(*Phy:* area in hectares, *Fin:* rupees in Crore)

Sl. No.	States	FY- 2016-17							
		Physical						Financial	
		Target			Achievement				
		Advance Work	No. of households	Creation Work	Advance Work	No. of households	Creation Work	Fund Released	Fund Utilized
1	Andhra Pradesh	881	1246	-	150	-	-	1.055	0.087
2	Chhattisgarh	-	-	19128	-	-	19128	20.23	20.23
3	Karnataka	-	-	760		-	760	0.869	0.869
4	Manipur	-	-	8798	-	-	8789	7.823	7.823
5	Mizoram	19643	5100	-	9868.4	-		9.884	9.884
6	Odisha	-	-	2094	-	-	2094	1.39	1.39
7	Punjab*	-	-	-	1159	-	1159	-	4.13
8	Kerala*				2687.96	2115			9.148
	Total	20524	6346	30780	13865.36	2115	31930	41.25	53.561

*Amounts released to Kerala, Punjab and Uttarakhand during the year 2015-16 could not be utilized in the year 2015-16 which was revalidated for utilization during the year 2016-17. Punjab has also carried creation/plantation work due to Geo-morphology.

(*Phy:* area in hectares, *Fin:* rupees in Crore)

Sl. No.	States	FY- 2017-18		
		Physical Target		Fund Released
		Advance Work	Maintenance Work	
1	Chhattisgarh	-	19128	10.953
2	Mizoram	9774.6		20.00
3	Odisha	-	2094	1.406
	Total	9774.6	21222	32.359

Appendix-VIII
~~ANNEXURE-I~~

State Wise Organic Area Covered under PKVY Scheme 2015-16 to till date			
SL.No	Name of the State	No. of cluster	Are in hectare
1	Andhra Pradesh	433	8660
2	Bihar	327	6540
3	Chhattisgarh	188	3760
4	Gujarat	100	2000
5	Goa	4	80
6	Haryana	20	400
7	Jharkhand	100	2000
8	Karnataka	545	10900
9	Kerala	119	2380
10	Madhya Pradesh	880	17600
11	Maharashtra	932	18640
12	Odisha	320	6400
13	Punjab	50	1000
14	Rajasthan	755	15100
15	Tamil Nadu	112	2240
16	Telangana	300	6000
17	Uttar Pradesh	575	11500
18	West Bengal	120	2400
19	Assam	220	4400
20	Arunachal Pradesh	19	380
21	Mizoram	34	680
22	Manipur	30	600
23	Nagaland	24	480
24	Sikkim	150	3000
25	Tripura	50	1000
26	Meghalaya	45	900
27	Himachal Pradesh	110	2200
28	Jammu & Kashmir	28	560
29	Uttarakhand	550	11000
30	Andman & Nicobar	68	1360
	Total	**7208**	**144160**

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Appendix- IX
~~ANNEXURE-II~~

Crop	Variety	Remark
Paddy	IR-64 DRT 1	Drought Tolrant
Paddy	Swarna Sub-1	Submergence Conditions
Paddy	Sahbhagi Dhan	Submergence Conditions
Paddy	CR-1009	Salinity Tolrance
Wheat	Raj-3077	Drought Tolrant
Wheat	WH-1021	Drought Tolrant
Wheat	HD-2733	Drought Tolrant
Wheat	HD-2888	Drought Tolrant
Wheat	Pusa Wheat 107	Drought Tolrant
Wheat	HD-2987	Drought Tolrant
Barley	RD-2660	Drought Tolrant
Barley	RD-2715	Drought Tolrant
Barley	K-605	Drought Tolrant
Gram	GNG-1581	Drought Tolrant
Gram	GNG-1958	Drought Tolrant
Gram	RSG-888	Drought Tolrant
Mustard	RGN-229	Drought Tolrant
Mustard	RGN-236	Drought Tolrant
Mustard	RGN-48	Drought Tolrant
Mustard	RGN-73	Drought Tolrant
Mustard	RH-406	Drought Tolrant
Moth	Cazri-2	Drought Tolrant
Moth	RMO-257	Drought Tolrant
Guar	RGC-1038	Drought Tolrant
Guar	RGC-1055	Drought Tolrant
Guar	RGC-1066	Drought Tolrant
Taramira	RTM-2002	Drought Tolrant
Green Gram	GM-4	Drought Tolrant
Tomato	PED	Heat Tolrant

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Annexure - I

MINUTES OF THE NINETEENTH SITTING OF THE COMMITTEE ON ESTIMATES (2016-17

The Committee sat on Tuesday, the 28th February, 2017 from 1500 hrs. to 1745 hrs. in Committee Room 'C', Parliament House Annexe, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2 Shri A. Arunmozhithevan
3 Shri George Baker
4 Shri Dushyant Chautala
5 Shri Ashok Chavan
6 Shri Ashwini Kumar Choubey
7 Shri Sanjay Dhotre
8 Shri P.C.Gaddigoudar
9 Shri P. Kumar
10 Shri K.H. Muniyappa
11 Shri Konakalla Narayan Rao
12 Shri Arvind Sawant
13 Shri Gajendra Singh Shekhawat
14 Shri Jay Prakash Narayan Yadav

SECRETARIAT

1. Shri N.C. Gupta - Additional Secretary
2. Shri Vipin Kumar - Director
3. Shri R.S. Negi - Under Secretary

WITNESSES

1. Dr. Vandana Shiva - Environmental activist
2. Dr. Ravi Chellam - Executive Director, Greenpeace India

2. At the outset, the Chairperson welcomed the Members to the sitting of the Committee and directed to call Dr. Vandana Shiva as the first expert.

3. The Chairperson welcomed the witness and drew her attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' regarding the confidentiality of the proceedings of the Committee. He then asked her to introduce herself to the Committee.

4. Thereafter, the Chairperson asked her to brief the Committee on the subject 'Performance of the National Action Plan on Climate Change (NAPCC)'. She highlighted about the impact of climate change in the form of more frequent, more extended flooding and extreme rains in short spells, more extended droughts, melting of glaciers in the Himalayan region, the various lacunae, inadequacies and the fragmented nature of the eight Missions taken up as India's action plan on climate change, the orientation towards finding engineering solutions for climate change by ignoring the ecological solutions to an ecological problem, adding that climate change is not a fragmented problem and the solutions to climate change have to be systematic or holistic solutions. She stressed upon the need to guarantee affordable solar technologies under the National Solar Mission; need to include rural habitat and habitat for other species which is a major climate mitigation area in the National Mission on Sustainable Habitats which focuses only on urban habitat; the need to include women, communities in the policy framework of the National Water Mission, need to stop privatisation of water; need to adopt organic farming countrywide as it increases the soil's resilience and fertility and allows one to deal with climate change, need to evolve more climate change resilient seeds, among others. She also pointed out that organic farming is the solution for water mission, sustainable agriculture, sustainable habitat mission and organic farmers are climate mitigators. She stated that international worry is about temperature not going

beyond 1.5 degree Celsius to 2 degree Celsius because after that life will not be possible on this planet.

5. Thereafter, Dr. Ravi Chellam, Executive Director, Greenpeace India was called in to depose before the Committee. The Chairperson welcomed Dr. Ravi Chellam and drew his attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' regarding the confidentiality of the proceedings of the Committee.

6. After a brief introduction, he made a power-point presentation and pointed out that National Solar Mission's performance is impressive but there is need for increasing investment in renewable energy by optimally utilising the coal cess for reducing the carbon intensity of the country's electricity sector and it is important to see solar energy not on acres and acres of solar power plant, it has to be largely small and every rooftop is a solar plant and so solar power generation should be decentralized; there is no need to invest in new thermal power plants or nuclear power plants simply because the consequences are related to climate change; shutting down of old, inefficient coal power plants should be done for reducing pollution an CO_2 emissions under the National Mission on Sustainable Habitats; the Government should finalise and notify the inviolate Forest Policy on priority because if we delay it, there might not be much forest which can be called inviolate.

7. The verbatim proceedings of the sitting of the Committee were kept on record.

The witness then withdrew.

The Committee then adjourned.

Annexure - II

MINUTES OF THE TWENTIENTH SITTING OF THE COMMITTEE ON ESTIMATES (2016-17)

The Committee sat on Wednesday, the 1st March, 2017 from 1100 hrs. to 1530 hrs. in Committee Room 'E', Parliament House Annexe, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2 George Baker
3 Shri Ashok Chavan
4 Shri Ram Tahal Choudhary
5 Col. Sonaram Choudhary
6 Shri P.C.Gaddigoudar
7 Shri Sudheer Gupta
8 Smt. Poonam Mahajan
9 Shri K.H. Muniyappa
10 Shri Ravindra Kumar Pandey
11 Shri Md. Salim
12 Shri Arvind Sawant
13 Shri Jugal Kishore Sharma
14 Shri Gajendra Singh Shekhawat
15 Shri Rajesh Verma
16 Shri Jay Prakash Narayan Yadav

SECRETARIAT

1. Shri N.C. Gupta - Joint Secretary
2. Shri Vipin Kumar - Director
3. Shri Srinivasulu Gunda - Additional Director

WITNESSES

1. Dr. Sunita Narain - Director General, Centre for Science and Environment

2.	Shri Chandra Bhushan	-	Climate Change expert from Centre for Science and Environment
3.	Shri Devinder Sharma	-	Agricultural Scientist and Food and Trade Policy Analyst

2. At the outset, the Chairperson welcomed the Members to the sitting of the Committee and directed that representatives of Centre for Science and Environment be called in.

3. The Chairperson welcomed the witnesses and drew their attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' regarding the confidentiality of the proceedings of the Committee.

4. After the introduction, the Chairperson asked the witnesses to brief the Committee on the subject 'Performance of the National Action Plan on Climate Change (NAPCC)'. The witnesses spoke on the need for single monitoring agency to ascertain the progress of eight Missions of the climate action plan of the Government, augmenting public transport system, solid waste management, green building norms/certification, ongoing negotiation over division of carbon budget among nations, conservation of water, underground sewerage system, decentralization of solar energy scheme, etc.

5. The Members also raised several queries and sought clarification from the witnesses to which they duly responded. The Chairperson asked the witnesses to furnish to the Committee Secretariat detailed replies on points to which they could not readily respond.

6. The Chairperson then directed to call Shri Devinder Sharma, Agricultural Scientist and Food and Trade Policy Analyst. The Chairperson welcomed the witness and drew his attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' regarding the confidentiality of the proceedings of the Committee.

7. After the introduction, the witness briefed the Committee on National Action Plan on Climate Change and highlighted major issues namely loss of water and desertification of villages, shifting of apple cultivation at higher altitude due to rise in temperature, change in agricultural pattern in the Himalayan region, possibility of Sutlej

river getting dried by 2022, suicide by farmers, absence of coordination among the eight missions of the climate action plan of the Government, need to adopt organic farming for sustainable agriculture, etc.

8. The Members also raised several queries and sought clarification from the witness to which he duly responded. The Chairperson asked the witness to furnish to the Committee Secretariat detailed replies on points to which he could not readily respond.

The witness then withdrew.

9. The verbatim proceedings were kept on record.

The Committee then adjourned.

Annexure - III

MINUTES OF THE SECOND SITTING OF THE COMMITTEE ON ESTIMATES (2017-18)

The Committee sat on Friday, the 12th May, 2017 from 1430 hrs. to 1735 hrs. in Committee Room 'G074', Parliament Library Building, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2 Shri A. Arunmozhithevan
3 Shri Kalyan Banerjee
4 Shri Ashwini Kumar Choubey
5 Shri Ram Tahal Choudhary
6 Col. (Retd.) Sona Ram Choudhary
7 Shri Ramen Deka
8 Shri Sanjay Dhotre
9 Smt. Raksha Khadse
10 Shri P. Kumar
11 Shri Ravindra Kumar Pandey
12 Shri Konakalla Narayana Rao
13 Shri Arvind Sawant
14 Shri Janardhan Singh Sigriwal
15 Shri Y.V. Subba Reddy

SECRETARIAT

1. Shri N.C. Gupta - Joint Secretary
2. Shri Vipin Kumar - Director
3. Shri Srinivasulu Gunda - Director
4. Shri R.C. Sharma - Deputy Secretary

WITNESSES

1. Shri Rajani Ranjan Rashmi - Special Secretary, Ministry of Environment, Forests & Climate Change

2.	Shri Arun Kumar Mehta	-	Joint Secretary (CC-I/c), Ministry of Environment, Forests & Climate Change
3.	Shri Pankaj Asthana	-	Inspector General of Forests, National Afforestation and Eco-Development Board (NAEB)
4.	Smt. Bharati	-	Director, National Mission for a Green India (GIM)
5.	Shri Abhay Bakre	-	Director General, Bureau of Energy Efficiency (BEE)
6.	Dr. Akhilesh Gupta	-	Advisor, Department of Science and Technology (Ministry of Science and Technology)
7.	Dr. P.C. Maithani	-	Advisor, Ministry of New and Renewable Energy
8.	Shri R.B Sinha	-	Joint Secretary, Department of Agriculture, Cooperation and Farmers Welfare (Ministry of Agriculture and Farmers Welfare)
9.	Smt. Rekha Pai	-	Inspector General of Forests, Ministry of Environment, Forests & Climate Change
10.	Shri V.K. Chaurasia	-	Advisor, Ministry of Urban Development
11.	Shri Joginder Singh	-	Advisor, National Water Mission
12.	Shri Satish Chandra	-	Director, National Water Mission

2. At the outset, the Chairperson briefed the Members about the importance of the subject and adverse impact of climate change on our ecological system, food, water, air and flora and fauna. After a brief discussion, the representatives of Ministry of Environment, Forests & Climate Change and representatives from other Ministries associated with National Action Plan on Climate Change were called in to depose before the Committee.

3. The Chairperson welcomed the witnesses and drew their attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' about the confidentiality of the proceedings of the Committee.

4. The Chairperson asked the witnesses to introduce themselves and to brief the Committee on the subject 'Performance of the National Action Plan on Climate Change (NAPCC)'. The Special Secretary, Ministry of Environment, Forests & Climate Change made a power-point presentation on eight missions of the Government for tackling

climate change and informed about their current status. Then representatives of the Ministries explained on respective missions of climate change action plan and the steps taken/proposed to be taken to achieve the mission targets and progress made so far. The Committee also discussed with the witnesses on the role of India in the global climate change negotiation, peer review system of climate control performance amongst the nations, energy rating system of the electrical appliances, need for adopting the philosophy of sustainable consumption alongwith sustainable development goals, importance of Himalayan ecosystem for climate control, water, culture and security of the country, need for co-ordination amongst the eight countries of the Himalayan region and other countries which fall within the Himalayan ecosystem in preserving and protecting the Himalayan ecosystem.

5. The Chairperson impressed upon the need for introduction of lessons on climate change, energy conservation, protection and conservation of forests and biodiversity and traditional knowledge system of Himalayan ecosystem in the school and college curriculum.

6. The Members also raised several queries and sought clarification from the witnesses to which they duly responded. The Chairperson asked the witnesses to furnish detailed replies on points to which they could not readily respond.

7. The verbatim proceedings were kept on record.

The Committee then adjourned.

Annexure - IV

MINUTES OF THE FOURTH SITTING OF THE COMMITTEE ON ESTIMATES (2017-18)

The Committee sat on Tuesday, the 11th July, 2017 from 1100 hrs. to 1330 hrs. in Committee Room '139', Parliament House Annexe, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2. Shri Sultan Ahmed
3. Shri Kalyan Banerjee
4. Shri Dushyant Chautala
5. Shri Ashwini Kumar Choubey
6. Shri Ramen Deka
7. Shri Sanjay Dhotre
8. Shri P.C. Gaddigoudar
9. Shri Prakash B. Hukkeri
10. Smt. Raksha Khadse
11. Shri Y.V. Subba Reddy
12. Shri Arvind Sawant
13. Shri Janardhan Singh Sigriwal
14. Shri Jugal Kishore Sharma
15. Shri Jai Prakash Narayan Yadav

SECRETARIAT

1.	Smt. Sudesh Luthra	-	Additional Secretary
2.	Shri N.C. Gupta	-	Joint Secretary
3.	Shri Vipin Kumar	-	Director

WITNESSES

Ministry of Environment, Forest and Climate Change

1. Shri Ajay Narayan Jha, Secretary
2. Shri Siddhanta Das, Director General Forest & Special Secretary
3. Shri Ravi Shankar Prasad, Joint Secretary, Climate Change

4. Dr. J R Bhatt, Advisor, Climate Change
5. Ms. Anuradha Singh, Director, Climate Change
6. Shri Shard, Scientist-D, Climate Change
7. Ms. Richa Verma, Consultant, Climate Change

Ministry of Power

1. Shri Ajay Kumar Bhalla, Secretary
2. Shri Raj Pal, Economic Adviser
3. Shri Abhay Bakre, DG-BEE
4. Shri Saurab Kumar, MD-EESL

Ministry of New and Renewable Energy

1. Shri Anand Kumar, Secretary
2. Shri Jatindra Nath Swain, Joint Secretary
3. Shri Dilip Nigam, Sci. - G
4. Shri B.L. Ram, Sci. - G
5. Dr. P.C. Maithani, Sci. - G
6. Shri K.S. Popli, CMD (IREDA)
7. Shri C. Kannan, Director (SECI)
8. Dr. G. Prasad, Sci. - F
9. Dr. R.P. Goswani, Sci.- F
10. Shri I.P. Singh, Sci. - F
11. Dr. Pankaj Saxena, Sci. - F

2. At the outset, the Chairperson welcomed the members and apprised about the agenda for the sitting i.e. to take evidence of the representatives of the nodal Ministry i.e. the Ministry of Environment, Forest & Climate Change and various other Ministries on the subject 'Performance of the National Action Plan on Climate Change'. After a brief internal discussion, the representatives of the Ministry of Environment, Forest & Climate Change, Power and New & Renewable Energy were called in to depose before the Committee on National Mission for Enhanced Energy Efficiency (NMEEE) and Jawaharlal Nehru National Solar Mission.

(The witnesses then took the seats)

3. The Chairperson welcomed the witnesses and drew their attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' about the confidentiality of the proceedings of the Committee.

4. The representatives of the Ministry of Power then made a power-point presentation on the various aspects related to the implementation of National Mission for Enhanced Energy Efficiency (NMEEE), which include targets and achievements, coverage, outcome and mechanism under Perform, Achieve and Trade (PAT); a regulatory instrument to reduce specific energy consumption in energy intensive industries, various programmes like Bachat Lamp Yojana, Super Efficient Equipment Programme for market transformation for energy efficiency. The salient features of Framework for Energy Efficient Economic Development (FEED), its objective, rules, operational manual, financial details, etc. were also elaborated. The representatives also highlighted the challenges before the Mission in the presentation. The Committee thereafter deliberated on various issues which include implementation of NMEEE particularly the reduced allocations at RE stage and under-utilization/reducing allocations/expenditure in various years during the period 2010-11 to 2016-17, technological innovation/research being done for energy efficiency and efficiency of solar cells and modules and efforts being made for use of LED bulbs for energy efficiency, etc.

5. The representatives of the Ministry of New & Renewable Energy thereafter briefed the Committee on the National Solar Mission by making a power-point presentation focusing on the roadmap for achieving 100GW target of solar energy, year-wise and cumulative targets, support mechanism for solar power in India, various schemes launched under National Solar Mission, solar parks, progress made so far in the solar sector, factors leading to reduction in solar tariffs, Suryamitra programme implemented through National Institute of Solar Energy, etc.

6. The Members raised several queries and sought clarifications from the witnesses to which they duly responded. The Chairperson asked the witnesses to furnish detailed replies to points on which information was not readily available.

7. The verbatim proceedings were kept on record.

The Committee then adjourned.

Annexure - V

MINUTES OF THE FIFTH SITTING OF THE COMMITTEE ON ESTIMATES (2017-18)

The Committee sat on Tuesday, the 11th July, 2017 from 1500 hrs. to 1745 hrs. in Committee Room 'B', Parliament House Annexe, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2. Shri Sultan Ahmed
3. Shri A. Arunmozhithevan
4. Shri Kalyan Banerjee
5. Shri Dushyant Chautala
6. Shri Ashwini Kumar Choubey
7. Col. (Retd.) Sona Ram Choudhary
8. Shri Ramen Deka
9. Shri Sanjay Dhotre
10. Shri P.C. Gaddigoudar
11. Shri Prakash B. Hukkeri
12. Smt. Raksha Khadse
13. Dr. Sanjay Jaiswal
14. Shri P. Kumar
15. Shri Y.V. Subba Reddy
16. Shri Arvind Sawant
17. Shri Janardhan Singh Sigriwal
18. Shri Jugal Kishore Sharma
19. Shri Jai Prakash Narayan Yadav

SECRETARIAT

1. Smt. Sudesh Luthra - Additional Secretary
2. Shri N.C. Gupta - Joint Secretary
3. Shri Vipin Kumar - Director

WITNESSES

Ministry of Environment, Forest and Climate Change

1. Shri Ajay Narayan Jha, Secretary
2. Shri Siddhanta Das, Director General Forest & Special Secretary
3. Shri Ravi Shankar Prasad, Joint Secretary, Climate Change
4. Dr. J R Bhatt, Advisor, Climate Change
5. Ms. Anuradha Singh, Director, Climate Change
6. Shri Shard, Scientist-D, Climate Change
7. Ms. Richa Verma, Consultant, Climate Change

Ministry of Water Resources, River Development and Ganga Rejuvenation

1. Dr. Ariz Ahmad, Mission Director, National Water Mission (NWM)
2. Shri U.P. Singh, DG, NMCG
3. Shri Narendra Kumar, Chairman, CWC
4. Shri Sanjay Kundu, Joint Secretary (WR,RD & GR)
5. Shri S. Masood Husain, Member, CWC
6. Shri Jagmohan Gupta, JS & FA (WR, RD & GR)
7. Shri Akhil Kumar JS(WR, RD & GR)
8. Shri K. Vohra, Commissioner (WR)
9. Shri B.R.K. Pillai, Commissioner (WR)
10. Shri Joginder Singh, Adv. NWM
11. Shri G.C. Pati, Member, CGWB
12. Shri S.K. Mohiddin, Scientist - D, NWM

2. The Chairperson welcomed the representatives of the Ministries of Water Resources, River Development & Ganga Rejuvenation and Environment, Forest & Climate Change to the sitting of the Committee and drew their attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' about the confidentiality of the proceedings of the Committee. In the opening remarks, the Hon'ble Chairperson particularly referred to the Paris Convention and the commitments of the country in this regard as well as issues related to the eco-system in the various parts of the country.

3. The Ministry of Water Resources, River Development & Ganga Rejuvenation then made a power-point presentation on 'National Water Mission' highlighting various aspects which include possible implication of climate change on water resources, decline in the glaciers and snowfields in the Himalayas, water resource scenario in the country, aquifer mapping, water stressed blocks/units of the country, working of Water Resources Information System of India, Hydrological Observation Station and satellite-

based telemetry, assessment of impacts of climate change on river basin-wise, State action for water conservation, and other aspects such as their targets and achievements, financial details and the challenges lying ahead in implementing the Mission.

4. The representative of the Ministry Environment, Forest & Climate Change thereafter briefed the Committee on the 'Green India Mission' by making a power-point presentation which focused on the objective of increasing forest cover on 5 mha of forest/non-forest lands, improving quality of forest cover on another 5 mha, improving ecosystem services such as biodiversity and hydrological services, enhancing annual CO_2 sequestration by 50-60 million tonnes by 2020. The Ministry also highlighted the National Afforestation Programme and convergence with MGNREGS schemes and challenges faced by the Ministry like inadequate budget allocation, among others.

5. The members raised several queries and sought clarifications from the witnesses to which they duly responded. The Chairperson asked the witnesses to furnish detailed replies on points which could not be responded.

6. The verbatim proceedings were kept on record.

The Committee then adjourned.

Annexure - VI

MINUTES OF THE SIXTH SITTING OF THE COMMITTEE ON ESTIMATES (2017-18)

The Committee sat on Wednesday, the 12th July, 2017 from 1100 hrs. to 1330 hrs. in Committee Room 'G074', Parliament Library Building, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2. Shri Dushyant Chautala
3. Shri Ashwini Kumar Choubey
4. Shri Ram Tahal Choudhary
5. Col. (Retd.) Sona Ram Choudhary
6. Shri P.C. Gaddigoudar
7. Shri Prakash B. Hukkeri
8. Smt. Raksha Khadse
9. Dr. Sanjay Jaiswal
10. Shri Rajesh Pandey
11. Shri Ravindra Kumar Pandey
12. Dr. Bhagirath Prasad
13. Shri Konakalla Narayan Rao
14. Shri Arvind Sawant
15. Shri Janardhan Singh Sigriwal

SECRETARIAT

1. Smt. Sudesh Luthra - Additional Secretary
2. Shri N.C. Gupta - Joint Secretary
3. Shri Vipin Kumar - Director

WITNESSES

Ministry of Environment, Forest and Climate Change

1. Shri Siddhanta Das, Director General Forest & Special Secretary
2. Shri Ravi Shankar Prasad, Joint Secretary, Climate Change
3. Dr. J R Bhatt, Advisor, Climate Change

4. Ms. Anuradha Singh, Director, Climate Change
5. Shri Shard, Scientist-D, Climate Change
6. Ms. Richa Verma, Consultant, Climate Change

Ministry of Science & Technology (Department of Science & Technology)

1. Prof. Ashutosh Sharma, Secretary, Dept. Science & Technology
2. Dr. Akhilesh Gupta, Adviser, Dept. of Science & Technology
3. Dr. Nisha Mendiratta, Scientist G, Dept. of Science & Technology

2. At the outset, the Chairperson welcomed the members to the sitting of the Committee convened to take evidence of the above Ministries on (i) National Mission for Sustaining the Himalayan Ecosystem (NMSHE) and (ii) National Mission on Strategic Knowledge for Climate Change in the context of examination of the subject 'Performance of the National Action Plan for Climate Change (NAPCC)'. The Chairperson then directed that the witnesses be called in.

(The representatives of the aforesaid Ministries then took their seats)

3. The Chairperson welcomed the witnesses and drew their attention to Direction 55(1) of Directions by the Speaker, Lok Sabha, regarding confidentiality of the proceedings of the Committee. After the customary introduction, the representatives of the Ministry of Science and Technology made power-point presentations on the aforesaid two Missions coming under its purview one by one. The presentations covered various areas like broad objectives, year-wise allocation of funds and expenditure during the years 2011-12 to 2017-18, activities undertaken, etc. under the respective Missions. The members raised several queries and sought clarifications from the witnesses. The Chairperson, thereafter, directed the witnesses to furnish the Committee Secretariat detailed replies to the points to which they could not readily respond at the earliest.

The witnesses then withdrew.

The verbatim record of proceedings has been kept.

The Committee then adjourned.

Annexure - VII

MINUTES OF THE SEVENTH SITTING OF THE COMMITTEE ON ESTIMATES (2017-18)

The Committee sat on Wednesday, the 12th July, 2017 from 1430 hrs. to 1725 hrs. in Committee Room 'G074', Parliament Library Building, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2. Shri Dushyant Chautala
3. Shri Ashwini Kumar Choubey
4. Shri Ram Tahal Choudhary
5. Col. (Retd.) Sona Ram Choudhary
6. Shri P.C. Gaddigoudar
7. Shri Prakash B. Hukkeri
8. Smt. Raksha Khadse
9. Dr. Sanjay Jaiswal
10. Shri Rajesh Pandey
11. Shri Ravindra Kumar Pandey
12. Dr. Bhagirath Prasad
13. Shri Konakalla Narayan Rao
14. Shri Janardhan Singh Sigriwal
15. Shri Gajendra Singh Shekhawat

SECRETARIAT

1. Smt. Sudesh Luthra - Additional Secretary
2. Shri N.C. Gupta - Joint Secretary
3. Shri Vipin Kumar - Director

WITNESSES

Ministry of Environment, Forest and Climate Change

1. Shri Siddhanta Das, Director General Forest & Special Secretary
2. Shri Ravi Shankar Prasad, Joint Secretary, Climate Change
3. Dr. J.R. Bhatt, Advisor, Climate Change
4. Ms. Anuradha Singh, Director, Climate Change

5. Shri Shard, Scientist-D, Climate Change
7. Ms. Richa Verma, Consultant, Climate Change

Ministry of Urban Development

1. Shri Praveen Prakash, Joint Secretary
2. Shri J.P. Aggarwal, Commissioner, DDA
3. Shri K.K. Joaddar, Chief Planner, TCPC
4. Shri Papiya Sarkar, Chief Architect, Delhi Metro
5. Shri Rakesh Garg, CGM, NBCC
6. Shri V.S. Pandey, Director (MRTS)

Ministry of Agriculture & Farmers Welfare (Department of Agriculture, Cooperation & Farmers Welfare)

1. Shri S.K. Pattanayak, Secretary, DAC&FW
2. Shri A.P. Singh, Additional Commissioner
3. Shri Jalaj Srivastava, Additional Secretary, DAC&FW
4. Shri R.B. Sinha, Joint Secretary, RFS Div, DAC&FW
5. Dr. P. Shakil Ahammed, Joint Secretary, Hort Div, DAC&FW
6. Shri M.K. Singh, Joint secretary, (LH&CNDD), DADF
7. Shri B. Rath, Additional Commissioner, RFS Div., DAC&FW
8. Dr. S. Bhaskar, ADG(AAF&CC-ICAR)
9. Dr. K. Sammi Reddy, Director, CRIDA & Incharge NICRA
10. Smt. Vandana Dwivedi AdC(INM)
11. Ms. Manda Verma, Assistant Commissioner, RFS Div., DAC&FW

2. At the outset, the Chairperson welcomed the representatives of aforesaid Ministries to the sitting of the Committee and drew their attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' about the confidentiality of the proceedings of the Committee.

3. The representatives of the Ministry of Urban Development after the customary introduction made a power-point presentation on National Mission on Sustainable Habitat (NMSH) covering inter alia the issues like objectives of the Mission, Flagship Missions/programmes viz. AMRUT, Smart City, Swachh Bharat, Urban Transport Programme and their implementation.

4. The representatives of the Ministry of Agriculture & Farmers Welfare (Department of Agriculture, Cooperation & Farmers Welfare) thereafter introduced themselves and made a power-point presentation on National Mission for Sustainable Agriculture (NMSA) that focused on the practice of organic farming, production of bio-fertilizers, precision irrigation, crop diversification, less water consuming cropping system, climate resilient varieties, identification of genotypes of crops with enhanced CO_2 fixation potential, climate resilient genotypes with greater adaptation to drought, flood, salinity and high temperature, Soil Health Card Scheme, 100% production of neem-coated urea, the challenges faced by the Ministry in implementation, etc.

5. The members raised several queries and sought clarifications from the witnesses to which they duly responded. The Chairperson, thereafter, directed the witnesses to furnish the Committee Secretariat detailed replies to the points to which they could not readily respond at the earliest.

The verbatim proceedings were kept on record.

The Committee then adjourned.

Annexure - VIII

MINUTES OF THE TWELFTH SITTING OF THE COMMITTEE ON ESTIMATES (2017-18)

The Committee sat on Tuesday, the 26th September, 2017 from 1130 hrs. to 1330 hrs. in Committee Room 'D', Parliament House Annexe, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2. A. Arunmozhithevan
3. Shri Dushyant Chautala
4. Shri Ram Tahal Choudhary
5. Col. (Retd.) Sona Ram Choudhary
6. Shri Ramen Deka
7. Shri Sanjay Dhotre
8. Shri Prakash B. Hukkeri
9. Smt. Raksha Khadse
10. Dr. Sanjay Jaiswal
11. Shri P. Kumar
12. Shri Rajesh Pandey
13. Shri Ravindra Kumar Pandey
14. Dr. Bhagirath Prasad
15. Smt. Ranjeet Ranjan
16. Shri Konakalla Narayan Rao
17. Shri Y.V. Subba Reddy
18. Shri Arvind Sawant
19. Shri Janardan Singh Sigriwal
20. Shri Jugal Kishore Sharma
21. Shri Jai Prakash Narayan Yadav

SECRETARIAT

1. Smt. Sudesh Luthra - Additional Secretary
2. Shri N.C. Gupta - Joint Secretary
3. Shri U.C. Bharadwaj - Deputy Secretary

WITNESSES

MINISTRY OF EARTH SCIENCES

1.	Dr. M. Rajeevan	Secretary
2.	Dr. Vipin Chandra	Joint Secretary
3.	Prof. Ravi S. Nanjundiah	Director
4.	Dr. K. Somasundar	Advisor
5.	Dr. Gopal Raman Iyengar	Advisor
6.	Shri Vivek Mishra	Director (Parl.)

2. At the outset, the Chairperson welcomed the members and apprised about the agenda for the sitting i.e. to take evidence of the representatives of the Ministry of Earth Sciences in connection with the examination of the subject 'Performance of the National Action Plan on Climate Change'. After a brief internal discussion, the representatives of the Ministry of Earth Sciences were called in to depose before the Committee on the above subject.

(The witnesses then took the seats)

3. The Chairperson welcomed the witnesses and drew their attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' about the confidentiality of the proceedings of the Committee.

4. The representatives of the Ministry of Earth Sciences made a power-point presentation highlighting various aspects of working of Centre for Climate Change Research (CCCR), Pune. CCCR, Pune focuses on development of new climate modeling capabilities in India and South Asia concerning the science of climate change. The presentation also elaborated on temperature trends, trends of rainfall and heat waves over India, rapid warming of South Indian Ocean, future scenario of global warming and the Ministry's future plans, etc. The Committee thereafter deliberated on various issues which included role of the Ministry of Earth Sciences in policy framing and implementation of various climate change action programmes, lack of an apex body for climate data collection and integrated analysis, duplication of research activities on climate change with that of CSIR, use of data collected on Indian climate and marine

environment by foreign agencies, destruction of mangroves along the coastal areas, sea level rise and inundation of land etc.

5. The members raised several queries and sought clarification from the witnesses to which they duly responded. The Chairperson asked the witnesses to furnish detailed replies to points on which information was not readily available.

6. The verbatim proceedings were kept on record.

The Committee then adjourned.

Annexure - IX

MINUTES OF THE THIRTEENTH SITTING OF THE COMMITTEE ON ESTIMATES (2017-18)

The Committee sat on Tuesday, the 26th September, 2017 from 1500 hrs. to 1830 hrs. in Committee Room 'D', Parliament House Annexe, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2. Shri Dushyant Chautala
3. Shri Ram Tahal Choudhary
4. Col. (Retd.) Sona Ram Choudhary
5. Shri Ramen Deka
6. Shri Sanjay Dhotre
7. Shri Prakash B. Hukkeri
8. Smt. Raksha Khadse
9. Dr. Sanjay Jaiswal
10. Shri Rajesh Pandey
11. Shri Ravindra Kumar Pandey
12. Shri Nanabhou Falgunrao Patole
13. Dr. Bhagirath Prasad
14. Smt. Ranjeet Ranjan
15. Shri Konakalla Narayan Rao
16. Shri Y.V. Subba Reddy
17. Shri Arvind Sawant
18. Shri Janardan Singh Sigriwal
19. Shri Jugal Kishore Sharma
20. Shri Jai Prakash Narayan Yadav

SECRETARIAT

1. Smt. Sudesh Luthra - Additional Secretary
2. Shri N.C. Gupta - Joint Secretary
3. Shri U.C. Bharadwaj - Deputy Secretary

WITNESSES

MINISTRY OF HOUSING AND URBAN AFFAIRS

1.	Shri Durga Shankar Mishra	Secretary
2.	Dr. Sameer Sharma	Additional Secretary
3.	Shri V.K. Jindal	Jt. Secretary
4.	Shri Shiv Das Meena	Jt. Secretary
5.	Shri M.K. Sinha	OSD & JS
6.	Shri K.K. Joadder	Chief Planner, TCPO
7.	Shri R. Srinivas	T&C Planner, TCPO
8.	Shri S.A. Verma	GM, DMRC
9.	Shri Rakesh Garg	Superintending Engineer, NBCC
10.	Ms. Manjita Mahajan	Manager, NBCC
11.	Shri V.K. Chaurasia	Advisor, CPHEEO
12.	Shri Rohit Kakkar	Dy. Advisor, CPHEEO
13.	Shri Shivpal	Commissioner, DDA
14.	Ms. Ruchi Gupta	Jt. Director, NCRPB
15.	Shri S.S. Garg	Superintending Engineer, CPWD

MINISTRY OF RURAL DEVELOPMENT

1.	Shri Amarjeet Sinha	Secretary
2.	Dr. Nagesh Singh	Additional Secretary

MINISTRY OF DRINKING WATER AND SANITATION

1.	Shri Akshay Rout	Director General
2.	Shri Satyabrata Sahu	Joint Secretary (Water)
3.	Smt. V. Radha	Joint Secretary (SBM-G)
4.	Shri Samir Kumar	EA (Parliament)
5.	Shri Rajesh Kumar	Director
6.	Shri D. Rajashekhar	Deputy Advisor
7.	Shri Junaid Ahmad Usmani	Consultant

2. At the outset, the Chairperson welcomed the members and apprised about the agenda for the sitting i.e. to take evidence of the representatives of the Ministries of Housing & Urban Affairs, Rural Development and Drinking Water & Sanitation in connection with the examination of the subject 'Performance of the National Action Plan on Climate Change'. After a brief internal discussion, the representatives of the of the above Ministries were called in.

(The witnesses then took the seats)

3. The Chairperson welcomed the witnesses and drew their attention to Direction 55(1) of 'Directions by the Speaker, Lok Sabha' about the confidentiality of the proceedings of the Committee. The witnesses then introduced themselves.

4. The representatives of the Ministry of Housing & Urban Affairs made a power-point presentation focusing on the objectives of the National Mission on Sustainable Habitat and various activities being undertaken under Atal Mission for Rejuvenation and Urban Transformation (AMRUT), the Swachh Bharat Mission - Urban (SBM-U), the Smart Cities Mission and Urban Transport Programme. The Committee thereafter raised various issues which *inter alia* included model building bylaws, parameters/indicators to decide the ranking of cities on the basis of cleanliness index and norms to determine livability index of Indian cities in terms of security, cleanliness, sustainability, waste management, disaster management, etc. The representatives of the Ministry put forth their views on the concerns of the Committee.

5. The representatives of the Ministry of Rural Development then apprised the Committee about the role of MGNREGS in mitigating the negative effects of climate change in rural areas by undertaking activities such as tree planting, construction of various community ponds, wells, canals, etc. for water conservation and irrigation. The Committee also sought clarification from the representatives of the Ministry on various points which included the importance of adopting organic farming, non-pesticide management of pests, community management of sustainable agriculture, ground water recharge, benefit of drip irrigation vis-a-vis flood irrigation in conserving water and its economical use.

6. Finally, the Committee interacted with representatives of the Ministry of Drinking Water & Sanitation on various issues regarding adequate availability of water for proper sanitation and hygiene in the context of Swachh Bharat Mission - Rural, role and importance of independent verification in declaring Open Defecation Free (ODF) of an area, efficient and proper management and maintenance of water supply line, inclusion of water conservation topics in the text books of school and college curriculum, National Water Conservation Campaign, etc.

7. The Chairperson asked the witnesses to furnish detailed replies to the points on which information was not readily available with them.

8. The verbatim proceedings were kept on record.

The Committee then adjourned.

Annexure - X

MINUTES OF THE ELEVENTH SITTING OF THE COMMITTEE ON ESTIMATES (2018-19)

The Committee sat on Thursday, the 11th October, 2018 from 1630 hrs. to 1830 hrs. in Committee Room '53', Parliament House, New Delhi.

PRESENT

Dr. Murli Manohar Joshi – Chairperson

Members

2 Shri Ramesh Bidhuri
3 Col. Sonaram Choudhary
4 Dr. Nishikant Dubey
5 Shri P. C. Gaddigoudar
6 Shri Sanjay Jaiswal
7 Shri Rajesh Pandey
8 Shri Ravindra Kumar Pandey
9 Dr. Bhagirath Prasad
10 Md. Salim

SECRETARIAT

1. Smt Sudesh Luthra - Additional Secretary
2. Dr. Preeti Srivastava - Joint Secretary
3. Shri Santosh Kumar - Additional Director

2. At the outset, the Chairperson welcomed the Members to the sitting of the Committee.

3. The Committee then took up for consideration the following draft Reports :-

(i) *** *** *** *** ***

(ii) The Committee then took up for consideration the draft Report on 'Performance of the National Action Plan for Climate Change (NAPCC)' and adopted the same.

The Committee authorised the Chairperson to finalise the draft report(s) mentioned at *** & (ii) above on the basis of factual verification from the respective Ministry/Department and present the same to the House.

(iii) *** *** *** *** ***

The Committee, then, adjourned.