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**STANDING COMMITTEE ON WATER RESOURCES**

**(2016-2017)**

**SIXTEENTH LOK SABHA**

**MINISTRY OF WATER RESOURCES, RIVER DEVELOPMENT AND GANGA  
REJUVENATION**

**INDIGENOUS AND MODERN FORMS OF WATER CONSERVATION –  
TECHNIQUES AND PRACTICES**

**THIRTEENTH REPORT**



**LOK SABHA SECRETARIAT**

**NEW DELHI**

March, 2017 / Phalgun, 1938 (Saka)

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**TECHNIQUES AND PRACTICES**

*Presented to Lok Sabha on 16.03.2017*  
*Laid on the Table of Rajya Sabha on 16.03.2017*



**LOK SABHA SECRETARIAT**  
**NEW DELHI**

March, 2017 / Phalguna, 1938 (Saka)

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**COMPOSITION OF THE STANDING COMMITTEE ON WATER RESOURCES**  
**(2016-17)**

Shri Hukum Singh                                  -                                  *Chairperson*

**LOK SABHA**

2. Shri Radheshyam Biswas
3. Shri Devusinh Jesingbhai Chauhan
4. Shri Sudhir Gupta@
5. Shri Prakash B. Hukkeri\*
6. Shri B. Vinod Kumar
7. Shri Mohanbhai Kundariya#
8. Shri Maganti Murali Mohan
9. Shri Sidhant Mohapatra
10. Shri Abhijit Mukherjee
11. Shri Subhash Patel
12. Shri Sanjaykaka Ramchandra Patil
13. Shri Vijaysinh Mohite Patil
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17. Shri Ram Prasad Sarmah
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27. Shri Hishey Lachungpa
28. Shri Ananda Bhaskar Rapolu
29. Shri Sanjay Seth
30. Shri A.V. Swamy
31. Shri Pradeep Tamta

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@ Nominated w.e.f. 19.10.2016.

\* Nominated w.e.f. 23.11.2016.

# Nominated w.e.f. 19.10.2016.

## SECRETARIAT

- |    |                        |   |                            |
|----|------------------------|---|----------------------------|
| 1. | Shri Shiv Kumar        | - | <i>Joint Secretary</i>     |
| 2. | Smt. Rita Jaikhani     | - | <i>Director</i>            |
| 3. | Shri Kushal Sarkar     | - | <i>Additional Director</i> |
| 4. | Shri Ginsuanlian Guite | - | <i>Under Secretary</i>     |

## INTRODUCTION

I, the Chairperson, Standing Committee on Water Resources (2016-17) having been authorised by the Committee to submit the Report on their behalf, present the Thirteenth Report on “Indigenous and Modern Forms of Water Conservation – Techniques and Practices.”

2. The Committee (2016-17) took up the subject “Indigenous and Modern Forms of Water Conservation – Techniques and Practices” for a detailed examination and Report. The Committee took evidence of the representatives of the Ministry of Water Resources, River Development and Ganga Rejuvenation on 24 May, 2016.

3. The Report was considered and adopted by the Committee at their sitting held on 14 March, 2017.

4. The Committee wish to express their thanks to the representatives of the Ministry of Water Resources, River Development and Ganga Rejuvenation for providing the requisite written information and for the deposition made in connection with the examination of the subject.

5. The Committee would also like to place on record their sense of deep appreciation for the assistance rendered to them by the officials of the Lok Sabha Secretariat attached to the Committee.

**NEW DELHI**  
**8 March, 2017**  
**17 Phalguna, 1938 (Saka)**

**HUKUM SINGH,**  
***Chairperson,***  
***Standing Committee on Water Resources***

## CHAPTER I

### INTRODUCTORY

1.1 Our country is endowed with a rich and vast diversity of natural resources, water being the most precious of them. Water security, water management and its development is of immense importance in all walks of human life and also for all living beings.

1.2 According to Indian Meteorological Department (IMD), there are only 40 rainy days in India. Primary source of water in India is South-west and North-east Monsoons. Monsoon, however, is erratic and the duration and the amount of rainfall is highly variable in different parts of our country, hence, there is a need to conserve water from rainfall and surface runoff to the extent possible.

1.3 It is stated in the written note of the Ministry of Water Resources, River Development and Ganga Rejuvenation that Water is primarily a State subject, and hence, State Governments are taking various actions for development of water resources to augment the surface water storage capacities according to their own resources and priorities. The wastage of precious water can be reduced by creating more storage capacity. As per constitutional provisions, the development and management of water resources projects including creation of storage fall within the purview of the States. The water storage schemes are planned, investigated, implemented and managed by the State Governments as per their own priority and resources available with them. The Union Government renders assistance to States which is technical, advisory, catalytic and promotional in nature. The Central government is also providing financial support to States through schemes such as Accelerated Irrigation Beneficiary Programme, Repair, Renovation and Restoration of water bodies, Command Area Development and Water Management etc. Government of India has launched the National Water Mission with the



objective of conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management.

1.4 In the course of the examination of the subject, the Committee took evidence of the officials of Ministry of Water Resources, River Development and Ganga Rejuvenation on 24 May, 2016. Apart from oral testimony of the witnesses, the Committee obtained background documents from the Ministry of Water Resources, River Development and Ganga Rejuvenation. For questions which needed further clarifications, post-evidence clarifications / replies were also obtained from the Ministry.

1.5 The Committee's examination of the subject "Indigenous and Modern Forms of Water Conservation – Techniques and Practices" *inter-alia* include (i) Need for Water Conservation in India, (ii) Techniques and Practices of Water Conservation, (iii) Factors and Practices influencing Water Conservation in India, and (iv) National Water Mission.

## CHAPTER II

### NEED FOR WATER CONSERVATION IN INDIA

#### (a) Per Capita Live Storage in India vis-à-vis Other countries

2.1 According to the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD&GR), out of maximum feasible storage of 450 km<sup>3</sup>, total live storage of 253 km<sup>3</sup> has been constructed in India till XI Plan. The per capita live storage in India is about 209 m<sup>3</sup> based on population of 2011. The data regarding per capita live storage in some other countries is given in the table below:

**Table – 1 : Data on per capita live storage in some countries of the world**

Sl. No.	Name of Country	Per capita live storage (in cubic meters or m <sup>3</sup> )
1.	Russia	6103
2.	Australia	4733
3.	Brazil	3145
4.	USA	1964
5.	Turkey	1739
6.	Spain	1410
7.	China	1111
8.	South Africa	753

2.2 The Ministry of Water Resources, River Development and Ganga Rejuvenation, in a written information furnished to the Committee, stated that a per capita water availability of less than 1700 cubic meters (m<sup>3</sup>) is termed as a water-stressed condition whereas if per capita availability falls below 1000 m<sup>3</sup>, it is termed as a water scarcity condition. The Ministry, *inter-*

alia, have also stated that Russia can sustain consecutive droughts for about 4 years as its per capita water storage is about 4 times water stress index of 1700 m<sup>3</sup> per capita per year. Similarly, Australia can sustain for about 03 years of consecutive droughts. India, however, cannot sustain drought beyond one non-Monsoon season due to low per capita storage, and faces acute stress if any year happen to be a drought year.

2.3 When the Committee asked to suggest measures needed to be taken to increase per capita live storage capacity in India without adversely compromising on the ecological balance in different parts of India, the Ministry submitted:

“Measures for increased per capita live storage capacity without compromising the ecological balance are as follows:

- I. Creation of storage based water resources projects throughout the country on appropriate sites with carry over storage.
- II. Through various water conservation measures, taking up watershed development schemes, soil conservation measures, rainwater harvesting, etc.
- III. Repair, Renovation and Restoration of water bodies throughout the country in general and in notified blocks where ground water is becoming critical in particular.”

2.4 The Ministry of Water Resources, River Development and Ganga Rejuvenation, in a written statement, informed that although the average water availability in the country remains more or less fixed according to the natural hydrologic cycle, the per capita availability is reducing progressively owing to increasing population. In 1991, the national average per capita availability in India was around 2209 cubic meter (cu.m.) per year, which has gone down to about 1545 cu.m. per year in 2011. With the projected future population, the per capita water availability may go down to around 1340 cu. m. and 1140 cu.m. by the year 2025 and 2050 respectively.

2.5 On being asked by the Committee about India's present position regarding the national average water per capita availability vis-à-vis other countries of the world, the Ministry furnished the data which are reproduced in a table below:

**Table – 2 : Data on per capita water availability in India vis-à-vis some other countries of the world.**

Sl. No.	Name of Country	Per capita water availability (in cubic meters or m <sup>3</sup> )
1.	Russia	31883
2.	Australia	21764
3.	Brazil	41865
4.	USA	9802
5.	Turkey	2890
6.	Spain	2506
7.	China	2060
8.	South Africa	1007
9.	India	1545 (2011 census)

**(b) Decline in Ground Water Levels**

2.6 It is stated that in certain areas, ground water development is very high leading to severe decline in ground water levels in wells and tube wells, large seasonal drops in water levels in wells specially in hard rock areas and under certain situations, deterioration in quality of ground water. As a consequence, there has been (i) increase in pumping depths, drastic reduction in wells / tube wells yields and enormous rise in the cost of pumping ground water, (ii) widespread and acute scarcity of ground water in summer months for irrigation and drinking uses, and (iii) increase in fluoride content in certain areas and increase in salinity in the coastal

areas. According to the representative of the Ministry, as per data compiled by the Central Ground Water Authority (CGWA), there are 90% blocks of Punjab where water have been over-extracted. It was also stated that water being a State subject, 100% subsidy on power in Punjab is being given in respect of agricultural sector, despite the fact that the Kirit Parikh Committee Report (2010) had suggested that water should not be treated as such being a common resource.

2.7 The Committee called for the comments of the Ministry on the issue of excessive extraction of water due to free electricity provided by the State Governments in India, the Ministry in a written reply submitted as under:

“The rapid development of ground water has led to over-exploitation of ground water in certain regions of the country. In the State of Punjab, out of 138 assessment units 110 are Over-Exploited; 4 are Critical; 2 are Semi-Critical and 22 are Safe as per the Ground Water Resource Estimate Report, 2011. One of the major reasons is attributed for shifting to water intensive crop in the State of Punjab which has resulted in depletion of ground water table in many parts due to over-exploitation, imposing an increasing financial burden on farmers who need to deepen their wells and replace their pump sets and on State Governments whose subsidy burden for electricity supply increases due to the provision of free electricity in the State for agriculture connections.

- (1) Ground water use has expanded in the State, as it provides control over irrigation to the farmer and its growth stimulated by spread of electrification and subsidized power. Even in the command area of major irrigation projects of the State, farmers often use ground water as a matter of routine to supplement canal water to maximize agricultural production.
- (2) In order to prevent lowering of water tables due to excessive extraction, there is a dire need for cooperation with agricultural users. It is essential to develop a cooperative mechanism of water users and Panchayat representatives with an objective to regulate use within average annual recharge level. Further, the

ground water based resources (need) to be provided with a recharge structure which would help keep the source alive. Rain water harvesting in schools and community buildings are being made compulsory and individual household rooftop rain water harvesting systems are promoted. CGWB has prepared comprehensive ground water recharge plan for 45 notified blocks/ areas in the State of Punjab for addressing the problem of over-exploitation of ground water.”

2.8 To a query of the Committee whether any advisory has been issued by the Government to State / Local bodies to curb the extravagant supply of electricity for ground water extraction, the Ministry replied as follows:

“The following Initiatives (were) taken by Central Ground Water Board for Reducing Ground Water usage in Agriculture/ Irrigation Sector:

- (i) DO letter to all Chief Secretaries of the States for adoption of modern technology for judicious, efficient management utilization and development of ground water resources – as per recommendations of “Fifth Report of Standing Committee on Water Resources on Ground Water Scenario”..
- (ii) DO letter to Chief Secretaries of Haryana, Punjab & Rajasthan for revamping the agriculture power supply policy and pricing structure in order to curb wasteful and excessive withdrawal of water by the irrigation sector – as per recommendations of “Fifth Report of Standing Committee on Water Resources on Ground Water Scenario”.
- (iii) Letter to the Secretary, Ministry of Agriculture to propose economically viable tools and techniques for irrigation to propagate, educate and bring awareness among farmers in the over-exploited and water stress areas in the country – as per recommendations of “Fifth Report of Standing Committee on Water Resources on Ground Water Scenario”.

Other Directions/ Advisories by Central Ground Water Authority for Ground Water Management are:

- (i) Chief Secretaries/ Administrators, MoUD, NHAI, CRRI, CPWD, State Public Works Departments, Indian Railways, Sports Authority of India, Ministry of Youth Affairs, Ministry of Civil Aviation, etc. have been advised:
- To adopt Artificial Recharge/ RWH in Critical & Over-exploited blocks/ taluks/ mandals.
  - For adopting Artificial Recharge/ RWH on all the Govt. Buildings.
  - To ensure inclusion of RTRWH in building bye laws.
  - To promote conservation of water through mass awareness, management trainings, etc.”

2.9 The Ministry of Water Resources, River Development and Ganga Rejuvenation informed that Maharashtra is the first State which has set up Maharashtra Water Resources Regulatory Authority (MWRRA) in 2005 under the World Bank Programme. The MWRRA has implemented water tariff system in Maharashtra for agriculture, domestic and industrial users. It is informed that the assessment, recovery of the water charges from agriculture, domestic , industrial users and O&M cost in the State during the last 7 years are as follows:

**Table – 3 : Recovery of water charges from agriculture, domestic, industrial users and O&M cost in Maharashtra during last 7 years.**

Year	O&M Cost (including establishment)	Assessment*	(Rs. in Crore)
			Recovery
2013-14	843	607	515
2012-13	762	753	506
2011-12	765	651	620
2010-11	745	767	746
2009-10	709	811	803
2008-09	555	808	673
2007-08	466	674	627

2.10 The Ministry also *inter-alia* stated that as regards the use of the revenue collected, Government of Maharashtra ploughs back 75% of the revenue collected to the water user

associations. In case of non-irrigation users, revenue collected is deposited in Government treasury.

### **(c) Ground Water Improvement Programme**

2.11 As per Ministry of Water Resources, River Development and Ganga Rejuvenation, an initiative of Government of India, "Ground Water Improvement Programme" is stated to be launched shortly. Initially, five States, viz. Rajasthan, Haryana, Maharashtra, Gujarat and Karnataka, have been selected which have some of the most heavily exploited ground water areas in India and confront serious ground water availability and quality issues.

2.12 Asked about the funding pattern, the Ministry stated this would be Central Sector scheme and the budgetary support from Central Government and World Bank loan would be in the ratio of 50:50, subject to the same being approved by the Ministry of Finance and the approval of the Cabinet. The Project duration is of six years, and the programme will have inherent linkages with National Hydrology Project (NHP) and NAQUIM. The funds would be transferred to Special Purpose Vehicle or PIU in the State. An initial amount of 66% of the Central share approved will be released to the PIU and funds would be reimbursed after an expenditure of not less than 50% has been rendered by the State Government / SLSC. 15% funds will be used for institutional strengthening. The Scheme has provision for social audit and third party verification. Besides, the Programme is to be implemented in a 'Programme for Result' (P for R) mode under which disbursement will be hiked with the results achieved.



## CHAPTER III

### TECHNIQUES AND PRACTICES OF WATER CONSERVATION

3.1 'Water Conservation' means preservation and careful management of fresh water as a sustainable resources to protect the water environment and to meet current and future human demand. Water conservation in large scale is possible by construction of major and medium irrigation projects and in small scale, it is possible by traditional water bodies.

#### (A) Traditional Water Recharge Practices

3.2 India had had a rich tradition of water harvesting which is more than two millennia old. The Kuhals of Jammu, Kuls of Himachal Pradesh, Guls of Uttarakhand, Pats of Maharashtra, Zings of Ladakh, Zabos of Nagaland, Eris of Tamil Nadu, Keres of Karnataka, Tankas, Kundis, Bawdis, Jhalaras etc. of Rajasthan are but a few of the traditional rain harvesting systems which existed in India but have fallen into disuse with the introduction of piped water supply system.

3.3 The traditional artificial recharge practices of India since ancient times as per information received from the Ministry of Water Resources, River Development and Ganga Rejuvenation, are mentioned in the table below:

**Table – 4: Traditional Recharge Practices of India**

Eco-zone	Traditional water harvesting systems	Description	Found in
1. Trans-Himalayan Region	Zing	Tanks for collecting water from melted ice	Ladakh
2. Western Himalayas	Kul	Water channels in mountain areas	Jammu, Himachal Pradesh
	Naula	Small ponds	Uttaranchal
	Kuhl	Headwall across a ravine to divert water	Himachal Pradesh

		from a natural stream for irrigation	
	Khatri	Chambers carved in hard rock for storing water	Himachal Pradesh
3. Eastern Himalayas	Apatani	Terraced plots connected by inlet and outlet channels	Arunachal Pradesh
4. Northeastern Hill Ranges	Zabo	Impounding runoff	Nagaland
	Cheo-oziihi	Channels from rivers	Nagaland
	Bamboo drip irrigation	Water from streams in the hills is brought to the plains via bamboo pipes for drip irrigation	Meghalaya
5. Brahmaputra Valley	Dongs	Ponds	Assam
	Dungs / jam pois	Small irrigation canals linking rice fields and a stream	W. Bengal
6. Indo-Gangetic Plain	Ahar-pynes	Embanked catchment basin and channels	S. Bihar
	Bengal's inundation channels	Inundation canals	W. Bengal
	Dighis	Small square or circular reservoir fed by canals from rivers	Delhi
	Baolis	Stepwells	Delhi
7. Thar Desert	Kunds / kundis	Underground storage	W.Rajasthan
	Kuis / beris	Deep pits near tanks	W.Rajasthan

	Baoris / bers	Community wells	Rajasthan
	Jhalaras	Tank	Rajasthan, Gujarat
	Nadi	Village ponds	Jodhpur, Rajasthan
	Tankas	Underground tank	Bikaner, Rajasthan
	Khadins	Embankment across lower hill slopes	Jaisalmer, W. Rajasthan
	Vav / Vavdi / Baoli / Bavadi	Stepwells	Gujarat, Rajasthan
	Virdas	Shallow wells	Rann of Kutch, Gujarat
	Paar	Area where water has percolated, accessed by kuis	-
8. Central Highlands	Talab / Bandhis	Reservoirs	Bundelkhand, Madhya Pradesh
	SazaKuva	Open well	Mewar, E. Rajasthan
	Johads	Earthen check dams	Alwar district, Rajasthan
	Naada / bandh	Stone check dam	Mewar, Thar desert
	Pat	Diversion bund across stream	Jhabua district, Madhya Pradesh
	Rapat	Percolation tank	Rajasthan
	Chandela tank	Tank	Rajasthan
	Bundela tank	Tank	Rajasthan
9. Eastern Highlands	Katas / Mundas / Bandhas	Earthen embankments across drainage lines	Orissa & Madhya Pradesh
10. Deccan Plateau	Cheruvu	Reservoirs to store runoff	Chittoor, Cuddapah districts of Andhra Pradesh

	Kohli tanks	Tanks	Maharashtra
	Bhandaras	Check dams	Maharashtra
	Phad	Check dams and canals	North western Maharashtra
	Kere	Series of tanks	Central Karnataka
	Ramtek Model	Intricate network of groundwater and surface waterbodies, connected through surface and underground canals	Ramtek, Maharashtra
11. Western Ghats	Surangam	Horizontal well	Kasargode, Kerala
12. Western Coastal Plains	Virdas	Shallow wells	Rann of Kutch, Gujarat
13. Eastern Ghats	Korambu	Temporary wall of brushwood, grass and mud laid across channels to raise the level of water	Kerala
14. Eastern Coastal Plains	Yeri	Tank	Tamil Nadu
	Ooranis	Pond	Tamil Nadu
15. The Islands	Jackwells	Bamboo pipes are used to lead water into shallow pits	Great Nicobar Island

3.4 Regarding the status of indigenous water harvesting methods / practices in India, including their contribution to water resources conservation and management, the Ministry stated that as per the 4th MI Census, about 6 lakh tanks and storages in India are used for minor irrigation schemes under surface flow and surface lift and it has increased from 5.56 lakh ha during 3rd Census. The major States/UTs which have large number of reservoirs and tanks

include Andhra Pradesh (81 Th.), Maharashtra (71 Th.), Chhattisgarh (56 Th.), Madhya Pradesh (56 Th.), Odisha (39 Th.), Tamil Nadu (39 Th.), Uttarakhand (31 Th.), and West Bengal (30 Th.).

Out of these 6 lakh surface flow schemes including tanks, 5 lakh schemes are in use and remaining 1 lakh schemes are not in use due to various reasons. The total irrigation potential created through tanks is about 58.9 lakh ha out of which 39.31 lakh ha has been utilized; as such about 19.5 lakh ha has been lost due to underutilisation. Out of the surface flow schemes not in use, 74 thousand are temporarily not in use and about 24 thousand are permanently not in use.

3.5 When the Committee asked about the advantages enjoyed by these traditional water harvesting methods, the Ministry, in a written reply, submitted:

“Through the ages, Indian agriculture has been sustained by natural and man-made water bodies such as lakes, tanks, ponds and similar structures. A water body is a structure where rain water is accumulated or water is stored by diversion from a stream, nala or river. Water bodies serve as storage reservoirs of water in the monsoon dependent areas of the country where there exist a shorter period of rainfall and a long dry spell with very high deviation of annual rainfall. The small storage tanks are called ponds or bundhis which are mostly community owned. The large storage tanks whose command varies from 20 to 2000 hectares are generally constructed by government departments or local bodies. Water bodies are even religiously quite significant. Lakes of India, such as, Pushkar in Rajasthan, Gurudongmar in Sikkim, and others are renowned for their religious importance. The striking beauty of lakes of India, like Vembanad Lake (Kerala), Bhimtal Lake (Uttarakhand), etc has made them favourite haunts for the tourists. The lakes of Rajasthan add vigour to the colossal forts and palaces.”

3.6 The Ministry of Water Resources, River Development and Ganga Rejuvenation, in a written reply, stated that the water bodies have gone into disuse mainly due to prolonged and continuous neglect of maintenance. Heavy silting of the tank bed, choked up feeder channels, leaking and weak bund, leaky sluices and dilapidated surplus weirs and ill maintained distribution channels are the common deficiencies in the present conditions of these minor irrigation tanks. Further, encroachments in the tank bund, foreshore, water-spread and supply channels, deforestation and denundation in the catchment areas leading to extinction of water bodies as a whole for housing and urbanization and indiscriminate use of tank beds as dumping yards have also contributed to deterioration of the water bodies.

3.7 On being asked by the Committee as to whether any study has been made so far regarding the efficacy, merits, viability or sustainability of traditional water harvesting techniques and also to state the efforts made by the Government to preserve, improve and develop the indigenous water harvesting methods in India, the Ministry have not furnished the relevant reply but have merely cited the various objectives of the Scheme for Repair, Renovation and Restoration (RRR) of water bodies being implemented by the Government of India (GOI) since the 10<sup>th</sup> Plan and which is being continued during the 12<sup>th</sup> Plan as well.

## **(B) Modern Water Conservation Techniques**

### **(i) Sprinkler and Drip Irrigation Systems**

3.8 According to the Ministry of Water Resources, River Development and Ganga Rejuvenation, pressurised irrigation lead to saving of water and increase in yield. Pressurised irrigation system is being promoted in canal commands to increase the efficiency and to save water. It consists of two types as given below:

**(a) Sprinkler irrigation :**

In sprinkler irrigation, water is discharged under pressure in air through a set of nozzles attached to a network of high density polyethylene pipes, simulating rainfall. Sprinkler irrigation systems are suitable for irrigating crops where the plant density is very high. It is widely used for cereals, pulses, seeds and other field crops. When many sprinklers are used they are attached to a pipeline at a predetermined spacing in order to achieve a uniform water application. The sprinkler or overhead irrigation system consists of conveying water to the field by aluminium or High Density Poly Ethylene (HDPE) pipes and distributing it over the field under pressure through a system of nozzles. For spraying water under pressure, a booster pump or high-speed low discharge pump is necessary. As water is conveyed through pipes, the seepage and evaporation losses are eliminated. Since the water application rate is less than the infiltration rate of the soil, there are no runoff losses in this method of irrigation. Even when the soil is too porous and difficult to distribute water uniformly in the surface method, a sprinkler system can irrigate it efficiently. This method can be used under most climatic conditions where irrigation is feasible.

**(b) Drip irrigation:**

Drip irrigation involves technology for irrigating plants at the root zone through emitters fitted on a network of pipes (mains, sub mains and laterals). The emitting devices could be drippers, micro sprinklers, mini sprinklers, micro jets, misters, fan jets, micro sprayers, foggers etc. which are designed to discharge water at prescribed rates. The use of different emitters will depend upon specific requirements, which may vary from crop to crop.

Water requirement, age of plant, plant to plant spacing, soil type, water quality and water availability etc are some of the factors which would decide the choice of the emitting system.

3.9 The Committee specifically desired to know the comparative merits of the various modern water conservation techniques. To this query, the Ministry, in a written reply, furnished the information:

“The important modern water conservation techniques are Drip and Sprinkler irrigation systems. State Governments are encouraging adoption of these water saving technologies through provision of subsidies to farmers on purchase of these systems. The comparative merits of these water conservation techniques are tabulated below:

**Table – 5: Comparative merits of Drip and Sprinkler irrigation.**

<i>Drip Irrigation System</i>	<i>Sprinkler Irrigation system</i>
Water is delivered at the root zone of the crops through emitters like drippers, micro sprinklers, mini sprinklers, micro jets, misters, fan jets, micro sprayers, foggers etc. Designed to discharge water at prescribed rates.	Requires energized pump sets
Use of different emitters depends upon specific requirements which may vary from crop to crop.	Micro tube drips work under a very low pressure head
Less water requirement resulting in water saving.	Irrigate more uniformly than gravity systems



Higher fertilizer application efficiency.	Typical efficiency is about 70%. Particularly more effective
Energy conservation.	Particularly effective in sandy undulating terrains.
Higher water use efficiency.	Require much less maintenance when compared with the conventional pressurized irrigation systems.
Feasible for irrigation in difficult terrains	Suitable for irrigation of crops with high density.
Suitable for problematic soils and prevention of water logging	Widely used for cereals, pulses, seeds and other field crops.
	Convenience of watering through pipes.
	Eliminates seepage and evaporation losses.
	Expensive land leveling not required
	No requirement of skilled manpower
	Frequent and light irrigation possible giving better response from the crops.

3.10 The Ministry also informed that as far as the application of water by Sprinkler and Drip is concerned, as per the 12<sup>th</sup> Plan guidelines of Command Area Development and Water Management (CAD&WM) programme, a minimum of 10% of Culturable Command Area (CCA)

of each project is to be covered through micro irrigation. Central Assistance to the tune of 50% is provided to the States for development of infrastructure to facilitate use of sprinkler / drip irrigation.

3.11 The Committee enquired about the current status of water conservation techniques in India, including the funds allocated and incurred by the Government on them during the last 03 (three) years. Responding to this query, the Ministry submitted:

“The Ministry has taken initiatives that the States adopt micro irrigation as far as possible, especially for development of common infrastructure to facilitate use of sprinkler / drop irrigation systems, in the command areas of new projects. The States of Punjab and Rajasthan have already come forward with projects having micro irrigation component.”

3.12 Regarding ‘fertigation’, the Ministry of Water Resources, River Development and Ganga Rejuvenation stated that it is a method of fertilizer application in which fertilizer is incorporated within the irrigation water by the sprinkler and drip system. In this system, fertilizer solution is distributed evenly in irrigation. The availability of nutrients is very high, therefore, the efficiency is more. In this method, liquid fertilizer as well as water soluble fertilizers are used. By this method, fertilizer use efficiency is increased from 80 to 90 per cent.

#### *Advantages of fertigation*

1. Nutrients and water are supplied near the active root zone through fertigation which results in greater absorption by the crops.
2. As water and fertilizer are supplied evenly to all the crops through fertigation, there is possibility for getting 25-50 per cent higher yield.
3. Fertilizer use efficiency through fertigation ranges between 80-90 per cent, which helps to save a minimum of 25 per cent of nutrients.

4. By this way, along with less amount of water and saving of fertilizer, time, labour and energy use is also reduced substantially.

3.13 It was further stated by the Ministry that other methods of modern water conservation techniques include inter-linking of water bodies through canals, mulching (application of organic or inorganic material to improve soil fertility), use of ICT Tools, Catchment Area Treatment, promoting in-situ moisture conservation practices, conjunctive use of surface and ground water (i.e. re-use of canal seepage water for conjunctive use with ground water and preventing water logging along canal banks), and minimization of losses due to evaporation through measure for reducing evaporation from reservoirs, canals etc. and closed conduits conveyance of water instead of water instead of open channels to reduce evaporation and percolation.

**(iii) Aquifer Mapping**

3.14 According to the Ministry of Water Resources, River Development and Ganga Rejuvenation, the National Aquifer Management (NAQUIM) Programme is an ongoing programme since 2012. The Ministry informed the Committee during evidence that under National Aquifer Mapping Programme, only an area of 5.5 lakh square kms. has so far been mapped and 23 lakh square kms. remain to be mapped, for which Rs. 3000 crore is needed.

3.15 The Committee desired to know the reasons for under-achievement in the implementation of National Aquifer Mapping Programme in India. To this query, the Ministry replied:

“Under National Aquifer Mapping Programme, the total mappable area of the country is around 23 lakh sq. km area. During 12th Plan period (2012-17), Aquifer Mapping and Management Plan programme has been taken up in 8.89 Lakh Sq. Km focusing on ground water over-exploitation, water scarcity in Bundelkhand and arsenic contamination. There has been delay in commencement of the programme due to late

approval of the scheme in September 2013. Out of 8.89 Lakh Sq. Km, an area of 5.25 lakh sq. km has been re-prioritized in the water stressed areas of the States of Haryana, Punjab, Rajasthan, Gujarat, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, NCT Delhi and Bundelkhand Region for aquifer mapping and preparation of aquifer-wise ground water management plans. So far, the data collection, data compilation, data gap analysis has already been completed in the 12<sup>th</sup> Plan target area of 8.89 lakh sq.km. Aquifer Maps and Management Plans for an area of 2.28 lakh sq. km has been prepared by March 2016 against the target of 2.38 lakh sqkm. Sincere efforts are being made to expedite the work and achieve the target within the specified time frame.”

3.16 To a Committee’s query about the time by which the NAQUIM is likely to be completed in India, the Ministry in a written reply, stated:

“As per the proposed programme, data generation for Aquifer Mapping in around 23 lakh sq. km mappable area of the country will be completed by March, 2020 and aquifer maps and management plans will be completed by December, 2022.”

3.17 When asked about the corrective steps taken by the Government to accelerate the pace of implementation of National Aquifer Mapping Programme, the Ministry submitted a written reply submitted:

“Review of the work done is being carried out at CGWB through a two tier evaluation mechanism comprising (i) An internal committee comprising of Members CGWB and headed by Chairman, CGWB and (ii) A peer review committee headed by Chairman, CGWB comprising of all Members of CGWB, and External experts, wherein regular presentations are being taken up for monitoring progress of work and its outputs.

- Regular progress is being reviewed through presentations at Ministry level including the weekly Meeting taken by Hon’ble Minister of Water Resources, River development and Ganga Rejuvenation.

- State Ground Water Coordination Committees (SGWCC) are geared up as per the direction of National Inter-departmental Steering Committee (NISC) for Aquifer Mapping & Management Program. The aquifer maps and management plans are presented and deliberated in the SGWCC.
- Workshops are being organized by CGWB involving concerned Central / State Government departments, academic institutions, experts etc. to have regular feedback on activities being carried out under Aquifer Mapping & Management Program.”

3.18 As regards the expected benefits of aquifer mapping programme, i.e. National Project on Aquifer Management (NAQUIM), the Ministry submitted:

“The expected benefits from NAQUIM include (i) specific information on Aquifer extent, its dimensions, resource availability and quality, (ii) characteristic of Aquifer in terms of its storage and transmission properties, available resources and (iii) areas, aquifers and design of ground water recharge interventions.”

3.19 The Ministry also submitted that based on the aquifer maps and management plans prepared under the programme, the concerned State Governments are being pursued for taking up of proposed management measures for sustainability of ground water resources. Aquifer Mapping is one of the components of Scheme of Ground Water Management and Regulation, for which a total outlay of Rs. 3319 crore has been made for 12<sup>th</sup> Plan (2012-2017). So far, the total expenditure on Aquifer Mapping in prioritized area (upto June, 2016) is Rs. 146.48 crore.

#### **(iv) Water Budgeting**

3.20 According to the Ministry of Water Resources, River Development and Ganga Rejuvenation, ‘Water Budgeting’ is an accounting of all the water utilised by the system that flows into and out of a project area. This area can be a project area, a wetland, a lake or any

other point of interest. Development can alter the natural supply of water and severely impact an area, especially if there are nearby ponds or wetlands. Water budgeting is worked out from 1<sup>st</sup> June to 31<sup>st</sup> May of that year collating with the onset of Monsoon in Kerala in the country. Based on the availability of water as per the rainfall data, allocation of water to various sectors (irrigation/agriculture/domestic/industrial) is made for the year especially for Rabi and Kharif crops.

The Ministry also stated that water use is also a factor driving availability, and is itself affected by more than simply the demand for consumption – with laws, regulations, economics, and other environmental factors influencing its use.

3.21 Replying to a query by the Committee on the role played by water budgeting in water conservation, the Ministry stated:

“As per the Indian Meteorological Department (IMD), there are only forty rainy days in the country. The Monsoon is erratic and the duration and amount of rainfall is highly variable in different parts of the country. About 80% of the total water is received during this period only which needs proper water conservation. Therefore, proper water budgeting is helpful to conserve water from rainfall and surface run off to the extent possible.”

3.22 The Committee invited comments of the Ministry on the feasibility of implementing water budgeting to promote water conservation in India. In reply, the Ministry of Water Resources, River Development and Ganga Rejuvenation stated:

“National Water Mission has requested all the States/UTs to prepare State Specific Action Plan (SSAP) for water sector linking with State Action Plans for Climate Change. The SSAP will address the present situation of water resource development and management, water governance, institutional arrangements, water related policies, cross boundary issues, agreements etc. So far, six States, namely Andhra Pradesh, Assam, Gujarat, West Bengal, Uttarakhand and Telangana have initiated their State

Specific Action Plans in first phase and other States (are) to follow. National Water Mission, Ministry of Water Resources, River Development and Ganga Rejuvenation has undertaken studies on benchmarking industrial water use to assist policy for enhancing industrial water use efficiency in India.

State/UT Government (s) have also been requested to set up Water Regulatory Authorities to regulate the use of water and to promote conservation. Government(s) of Maharashtra and Gujarat have established Water Regulatory Authorities in their State.”

## CHAPTER IV

### FACTORS AND PRACTICES INFLUENCING WATER CONSERVATION IN INDIA

#### **(a) Water Use Efficiency**

4.1 The Ministry of Water Resources, River Development and Ganga Rejuvenation, in a written note, stated that the efficient water use practices play an important role in water conservation in a particular area.

4.2 Regarding the steps taken by the Government to popularize the practices adopted for water conservation, the Ministry informed the Committee as follows:

“Modified Guidelines for the Accelerated Irrigation Benefits Programme (effective from October 2013) has encouraging provisions for inclusion of the ERM Projects of the water sector reforming States which are committed to implement Micro Irrigation in at least 10% of command area. Central Water Commission has been keeping eye on performance overview and management improvement of Major and Medium irrigation projects of the Country. It has so far appraised water use efficiency of 35 irrigation projects and 131 performance evaluation studies and the findings there-from were conveyed to the respective project authorities for taking up suggested corrective measures. It has been encouraging water auditing and benchmarking of irrigation projects. In this vein, CWC had published general guidelines for water audit and water conservation for the States as also the Guidelines for improving water use efficiency in irrigation, domestic & industrial sectors.

Under the Per Drop More Crop component of the Prime Minister’s Krishi Sinchai Yojana (PMKSY), promotion of efficient water conveyance and precision water application, installation of devices like drips, sprinklers, pivots and rain-guns in the farms is envisaged. Schemes to be taken up under this component are as follows :

- (i) Topping up of input cost particularly under civil construction beyond permissible limit (40%), under MGNREGS for activities like lining inlet, outlet, silt traps, distribution system etc.



- (ii) Construction of micro irrigation structures to supplement source creation activities including tube wells and dug wells (in areas where ground water is available and not under semi-critical / critical / over-exploited category of development) which are not supported under AIBP, PMKSY (Har Khet ko Pani), PMKSY (watershed) and MGNREGS as per block/district irrigation plan.
- (iii) Secondary storage structures at tail end of canal system to store water when available in abundance (rainy season) or from perennial sources like streams for use during dry periods through effective on-farm water management.
- (iv) Water lifting devices like diesel/ electric/solar pump sets including water carriage pipes, underground piping system.
- (v) Extension activities for promotion of scientific moisture conservation and agronomic measures including cropping alignment to maximize use of available water including rainfall and minimize irrigation requirement (Jal Sarankshan).”

4.3 When asked by the Committee to give suggestions for improving efficient water use practices in the country, the Ministry further submitted as under:

“In general, irrigation sector has been operating at low economic terms world over, being charged at subsidized rates on area basis, though monitored in volume for larger social benefits. Improving efficiency is a rather slow, expensive process that requires willingness, knowhow and action at various levels and is subject to local water scarcity situation. Element of reliability in canal irrigation has to be raised - in general, and prevailing supply based delivery in irrigation sector has to shift to the demand-based management.

Besides the mentioned smart irrigation scheduling and use of low flow systems; at farm level, with the co-operation of farmers, there are other possibilities like modest Crop Shifting – shifting a small percentage of lower-value water-intensive crops to higher-value water-efficient crops; advanced Irrigation Management water saving methods – alternate wetting and drying method of application, regulated deficit irrigation, crop diversification etc.

Until the users/WUAs are sensitized for efficient water use practices and roped in for water conservation, the on-ground improvement is a bit difficult. There need to

be lucrative incentivizing provisions to make them active stakeholders rather the end users.

Also, given the predominance of small land holder farmers in India, affordability of water saving technology is also a challenge and proper institutional financial interventions may be necessary for promoting the cost intensive low flow systems on sustainable basis.

There may be a Nationwide platform for intense dialogue with the famers - may be in the shape of farm schools/strengthened WALMIs - for capacity building of farmers and information dissemination about best practices, such as land levelling, warabandi, SRI, AWD, crop rotation etc. This would also help in demonstrating new practices as pilot projects.

The monitoring of water balance through auditing of the irrigation projects may sensitize all the concerned on potential water savings. Ground water mapping may help in optimizing conjunctive use.

So far as application of water by Sprinkler and Drip Irrigation methods is concerned, as per XII Plan guidelines of CADWM programme, minimum 10% of CCA of each project is to cover through micro-irrigation. Central assistance to the tune of 50% is provided to the States for development of infrastructure to facilitate use of sprinkler/ drip irrigation systems as an alternative to on-farm development works. Following schemes have been sanctioned in respect of micro irrigation works in 12<sup>th</sup> Plan:-

**Table – 6: Micro Irrigation works sanctioned in 12<sup>th</sup> Plan.**

<i>Name of project</i>	<i>State</i>	<i>Estimated Cost (Rs. cr.)</i>	<i>CCA (th.ha)</i>	<i>Year of Sanction/ inclusion</i>	<i>Central assistance released (Rs. Cr.)</i>
Development of pressure irrigation in command area of six lift schemes of IGNP, Stage-II	Rajasthan	1658.80	320.117	2015-16	10.85
Kandi Canal CADWM project	Punjab	73.44	19.867	2016-17	0.0

Kotla Branch, Part-II	Punjab	38.325	7.995	2015-16	4.01
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The suggestions for improving water use efficiency were furnished by the Ministry as follows:

- i. Enhanced coverage under micro-irrigation practices may be effective.
- ii. Participatory Irrigation Management with empowerment of Water Users' Associations (WUAs).
- iii. Volumetric measured supply of water at field levels to be monitored by WUAs
- iv. Levy of certain minimum water tariff so as to discourage wasteful drawl of water from irrigation systems.
- v. Enforcement of key measures (e.g. reasonable power tariffs) for encouraging conjunctive use of ground and surface water
- vi. Proper maintenance and management of surface water irrigation system so as to give an assured water supply for each field of the command area."

4.4 The Committee specifically desired to know whether any research / study has been undertaken to assess conservation and water management practices being used by various water users in the country. To this query, the Ministry, in a written reply, submitted:

"To make a realistic assessment of Water Use Efficiency (WUE) for completed major/medium irrigation projects under Plan Scheme of Ministry of Water Resources, River Development and Ganga Rejuvenation – 'R & D in Water Sector' thirty-five (35) studies have been undertaken by CWC (Central Water Commission). The recommendations/results of the study reports about interventions required / step to be taken up, have been sent to the concerned State Governments for taking necessary action".

4.5 Asked whether the Government proposed to undertake any research / study to ensure optimum utilization of water, preservation and management of fresh water as a sustainable resource, the Ministry replied:

“Various Research and Development organisations of the Ministry like National Institute of Hydrology, Central Water Commission, Central Ground Water Board and Central Water and Power Research Station etc are carrying out various research studies to ensure optimum utilisation of water, preservation and management of fresh water as a sustainable resource. NWM has identified eight river basins (Mahanadi, Mahi, Luni, Tapi, Sutlej, Sabarmati, Subarnarekha and western flowing rivers from Tadri to Kanyakumari) for study of impact of climate change in association with research institutes like IITs, NITs, IISc. and NIH under the R and D scheme of the Ministry. A scoping study on the Water Use Efficiency for the Major-Medium Irrigation Projects has been completed by NWM in association with Asian Development Bank (ADB). The report has been circulated to all the State Governments and uploaded on the website of MoWR, RD & GR for implementation. Baseline studies of major/medium water resource projects to get information on the present status of water use efficiency for 21 irrigation projects have been undertaken through NERIWALM, Tezpur, WALAMTARI, Hyderabad and WALMI, Aurangabad. National Water Mission has initiated actions to prepare State Specific Action Plan (SSAP) for water sector covering irrigation, agriculture, domestic water supply, industrial water supply and waste water utilization in respect of all the States/UTs.”

#### **(b) Climate Change and Water Conservation**

4.6 The Ministry during their deposition before the Committee stated that they have initiated “Climate Change, Impact Study on Eight River Basins” and global models are going to be statistically and dynamically down-scaled to carry out the effect of climate change in the range of 30 years, 50 years and 100 years from now. It is also stated that in assessing those impact, plan can be made for conservation of water. But these studies are yet to take off.

4.7 When the Committee asked the Ministry to elaborate as to how “Climate Change, Impact Study on Eight River Basins” of the Government is proposed to be completed, the Ministry submitted:

“The study proposals have been invited from academic institutions of repute like IITs, NITs, IISc, NIH, etc. for eight river basins viz. Mahanadi, Luni, Tapi, Satluj, Subarnrekha, Sabarmati, Mahi and Areas of Inland Drainage, Tadri to Kanyakumari river basin.

Further, other two studies on downscaling of coarse resolution climate variables simulated by General Circulation Models (GCMs) i.e. one project based on statistical downscaling (data-driven) and another based on dynamic downscaling (physics based), have also been initiated. The duration of the studies vary from 2 to 3 years.

Methodologies to model the hydrologic variables at a smaller scale based on large scale GCM outputs are known as downscaling. The methodologies include dynamic downscaling and statistical downscaling that produces future scenarios based on statistical relationship between larger scale climate features and hydrologic variables such as precipitation.

4.8 When the Committee enquired as to how these impact studies would benefit the goal of water conservation in India, the Ministry in a written reply submitted:

“Research studies have been initiated on assessing impacts of climate change specifically on water resources and on different adaptation and mitigation approaches. The present work will provide the meteorological projections for next hundred years considering greenhouse emission scenarios. The results will be used in river basin scale climate change impact assessment studies.

The research work would contribute to water resources sector in the following ways:

- a. The regional climate scenarios will guide the policy makers for future planning.
- b. The modelling results will provide estimate of the future water availability in the basin and would be useful in planning and development works.
- c. The model results might be used for assessing the effectiveness of the existing flood fighting structures and other infrastructures like bridges, weirs in the area under the flooding condition.
- d. Performance of reservoirs would be evaluated to assess the impact of climate change and adaptation measures will be suggested.

- e. The adaptation strategies will help the local population to minimise the risk due to changing climate.”

### **(c) Cropping Pattern and Water Conservation**

4.9 The Committee desired to know how cropping pattern impact water conservation in agricultural sector in a given area. To this query, the Ministry of Water Resources, River Development and Ganga Rejuvenation, in a written reply, submitted:

“At the time of designing any irrigation project, based on the availability of water during Kharif and Rabi seasons, suitable cropping pattern is suggested for both the seasons. This combination of crop variation is decided based on the water demand. If the proposed cropping pattern is being practiced by the farmers of particular command area, the entire command will be able to receive sufficient irrigation water. If the farmers change the cropping pattern, i.e. from less water demand to high water demand crops like sugarcane and paddy, then the designed irrigation system fails to irrigate the entire command area and generally the farmers at the head and middle reaches utilise all available water and the tail end farmers are deprived to get water for irrigation. Thus, for effective management of water, the proposed cropping pattern in the project area should be enforced so that each field in command could get adequate water.”

4.10 Elaborating on water-saving technologies such as sprinkler and drip irrigation systems, the Ministry further stated that State Governments are encouraging adoption of water-saving technologies, such as sprinkler and drip irrigation systems, through provision of subsidies to the farmers on the purchase of these systems. These technologies are recommended for achieving higher irrigation efficiencies and could be used for very small-sized holdings. While sprinklers require energized pump sets, micro tube drips can work under a very low-pressure head, with as little as a bucket full of water. Sprinklers tend to irrigate more uniformly than gravity systems and therefore efficiencies typically average about 70%. But in windy and dry areas

much water can be lost due to evaporation in this system. The sprinkler system is particularly effective in sandy undulating terrain. For fruits, vegetables and orchard crops, drip irrigation (also known as trickle irrigation) is more suitable. These systems require much less maintenance when compared with the conventional pressurized irrigation systems. The ease of maintenance is more significant in microtube drip systems. However, the adoption of these technologies by poor farmers would depend heavily on the supply of information, materials and services for installation.

Cropping pattern for irrigation projects is suggested by the concerned State Agriculture Department keeping in view the food habits, climate, etc. Water demands for this cropping pattern suggested by State Agriculture Department are matched with the available water. If water available is less, alteration in the cropping pattern is suggested and farmers are discouraged to grow water intensive crops.

#### **(d) Participatory ground water management in Maharashtra**

4.11 The Ministry informed that in the districts of Satara, Jalna and Beed in Maharashtra, the community decided to adopt efficient irrigation practices, change in cropping pattern from sugar to low water-consuming crops on the demand side. On the supply side, they adopted artificial recharge to enhance the yield of aquifer, and completed 116 recharge structures (55 in Satara, 30 in Jalna and 31 in Beed).

4.12 When the Committee asked about the role of the Government (Union/State) in the successful adoption of efficient ground water management practices in these 3 districts, the Ministry in a written reply, stated:

“Aquifer based participatory groundwater management pilot projects in these three districts was undertaken in Maharashtra Water Sector Improvement Project (MWSIP), aided by the World Bank. The project was implemented in total 52 villages of these districts. Tenure of project was from 2005 to 2013. State Government initiated the project activities with the mapping and delineation of the aquifer in the selected areas and then prepared the aquifer based water balance of the project area, with community participation. A non-Governmental Organization (NGO) was also engaged for facilitation.

The local community in each village was organized into Gram Panchayat Level Committees (GPLCs) having village level representation. The Gram Sabha approved their byelaws and then GPLCs were registered under the Society Registration Act. The members of the Executive Committee of GPLCs were elected through democratic process by holding elections.

After the formation of GPLCs and election of executive members, all the GPLCs in the pilot aquifer have been federated into Ground Water Management Association (GWMA) at the aquifer level. GWMA is an apex body for the aquifer and has a supervisory role for equitable utilization of ground water recharge and overseeing of the activities of GPLCs and controlling the actions that are detrimental to the sustainable development and management of ground water within the aquifer. Separate byelaws have been approved by GWMA.

The community has been sensitized to keep their water account and now they are measuring rainfall and ground water levels through GWMA and GPLCs and trying to manage the crops as per availability of ground water every year. GPLCs and GWMA have been enabled to deliberate on the current ground water situation in the aquifer and have adopted appropriate interventions to improve ground water efficiency, reduce ground water extraction and arrest declining of water levels.

The community manages aquifer with the help of NGO as per the Ground Water Management Action Plan (GWMAP) under the technical supervision of District Technical Support Group which is comprised of the officers from various disciplines and departments like Water Resources, Water Supply, Agriculture, and GSDA. Measures for controlling the surplus ground water along with the measures of artificial



ground water recharge are promoted. Based on the capacity of the aquifer and availability of surplus surface runoff, the artificial recharge structures were finalized.”

4.13 On being asked by the Committee if this model has been replicated elsewhere in the country, the Ministry replied that the same aquifer based participatory ground water management is being replicated in the Jalswarajya project. The project is being implemented in 7 districts of Maharashtra, and the same model is being propagated through the implementation of Maharashtra Ground Water (Development and Management) Act, 2009, which came into force from 1<sup>st</sup> June, 2014.

4.14 The Ministry also informed the successful implementation of ground water management by community participation / Gram Panchayat in Hiware Bazar, Ahmednagar district, Maharashtra having a population of 1233 (2011). This was achieved through water budgeting leading to change in cropping pattern and use of Drip/Sprinkler irrigation on the demand side, and construction of rain water harvesting, e.g. earthen bunds, percolation tanks, stone bunds, check dams, trenches, etc., afforestation and protection of recharge zones, and revival of water bodies on supply side. The benefits achieved include improvement in water level and increase in soil moisture, enhanced average income of the villagers due to assured crop yields, and assured drinking water supply.

4.15 When the Committee asked the role of the Government (Union/State/local bodies) in the successful implementation of ground water management in Hiware Bazar, Ahmednagar district, Maharashtra, the Ministry replied:

“The Government of Maharashtra played an active and crucial role in successful implementation of the ground water management programme in Hiware Bazaar. Encouraged by the support of villagers on 15 August 1994, *Yashwant Agriculture and*

*Watershed Development Trust* was established to implement the *watershed development programme* in the village. The Government of Maharashtra sanctioned Rs. 66 Lakhs under various schemes related to watershed development programme and the Villagers of Hiware Bazar contributed about Rs. 21 Lakhs in the form of Shramdan. Under this programme, around 660 soil and water conservation structures like contour bunding, nala bund, cement nala bund, van tale, percolation tank, loose boulder structures, earthen bund and storage bandhara in addition to CCT in private and panchayat lands were constructed by Shramdan of villagers till 2005. A large-scale tree plantation along the roadside and farm bunds was also taken up with the help of Forest Department, Government of Maharashtra and people's participation.

In 2006–07, Gramsabha decided to implement “Borewell Blast Technique (BBT)”, an unconventional method developed by Ground Water Survey and Development Agency, Government of Maharashtra in the village. This was taken up to increase ground water storage and recharge so as to strengthen source of drinking water existing along downstream side of watershed. Geo-physical study of village indicated that area above gaathan is favourable for using BBT to interconnect the upper and lower fractures within the basaltic aquifer system in the area. About 103 bore wells of depth 5 to 16 meters were drilled in 162 Sq m of land. These bore wells were charged by ammonium nitrate and blasted to create artificial fractures and cracks in hard massive basalt formation. It was observed that the yield of the well located downstream of the area has increased considerably.

The water-auditing programme introduced by Government of Maharashtra has been successfully implemented in the village. Under this programme, every Gram Panchayat is provided with the rain gauge equipment properly installed in the office premises at appropriate places. The villagers are trained to monitor and maintain daily rainfall record and to calculate the actual yearly availability of water based on rainfall of that year. They are also trained in monitoring the ground water levels in selected wells in the village. The data generated thus is utilised for allocation of water for its different uses in the village in a planned manner based on the decisions taken by the Gram Sabha. Thus Government of Maharashtra was involved in providing infrastructure facility, capacity building, data generation for water budgeting. This data

was used for participatory ground water management with active involvement of villagers as per the decisions taken by the Gram Sabha.”

4.16 The Ministry of Water Resources, River Development and Ganga Rejuvenation have informed that the model of participatory ground water management at Hiware Bazar, Ahmednagar, Maharashtra with social initiatives has been very effective. All these initiatives greatly improved the socio-economic conditions in the village, and the village was declared an ‘Ideal Village’ by the Government of Maharashtra. The Gram Panchayat also received the National Water Award in 2007 from Ministry of Water Resources (MoWR), Government of India. During 1992, there were 168 families Below Poverty Line (BPL). By 2008, there was not a single BPL family left. Earlier, there was a lot of migration from the village towards urban areas in search of work. Now, not only the migration has stopped, but reverse migration from urban areas to the village is noticed.

## CHAPTER V

### NATIONAL WATER MISSION

5.1 The Government of India has launched National Water Mission (NWM) as one of the 8 National Missions under National Action Plan for Climate Change. The main objective of the 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 NWM document approved by the Union Cabinet on 6<sup>th</sup> April, 2011 has identified 5 goals for the mission. Five goals identified for achievement under the National Water Mission are :

- (i) Comprehensive water data base in public domain and assessment of the impact of climate change on water resources;
- (ii) Promotion of citizen and state actions for water conservation, augmentation and preservation;
- (iii) Focussed attention to vulnerable areas including over-exploited areas;
- (iv) Increasing water use efficiency by 20%; and
- (v) Promotion of basin level integrated water resources management.

#### **(a) National Water Mission and study of impact of Climate Change on water resources**

5.2 The Ministry of Water Resources, River Development and Ganga Rejuvenation have, in a written statement, informed the Committee that to achieve goal for “comprehensive water data base in public domain and assessment of the impact of climate change on water resources”, the National Water Mission (NWM) has requested the Central Water Commission (CWC) to set up required number of hydro meteorological stations across the country above the permanent snowline, glaciated area, seasonal snow areas in Himalayan region, plain regions

and coastal areas based on global norms to facilitate collection of comprehensive data of water flow, water quality and sedimentation and overall water resources availability.

5.3 When asked by the Committee to give the updated status of the setting up of hydro meteorological stations proposed by CWC under National Water Mission, the Ministry submitted:

“Presently, there are 878 Hydrological observation Stations (HoS) working in different river basins. Central Water Commission (CWC) has a target of establishment 800 new (HoS) in 12<sup>th</sup> Plan out of which CWC has opened 676 new HoS upto December, 2016. The Scheme is under CWC, not NWM.

CWC has a target of 200 Automatic satellite based telemetry system (FY 2016-17) for hydrological network, real time information, improved water resource assessment, planning and flood forecasting. There is an achievement of 57 telemetry systems up to December, 2016.

There is a plan of establishing 100 additional CWC flood forecasting stations using hydrological and hydraulic modeling. The network is proposed to be expanded from existing 176 flood forecasting stations to 276 stations. 24 flood forecasting stations have been established at the end of December, 2016. CWC has issued about 6,627 flood forecasts during the year 2016-17.”

5.4 The Ministry of Water Resources, River Development and Ganga Rejuvenation have also stated that an independent website of NWM was launched on 26 April, 2016 which aims at providing all the information relating to water resources organizations and their activities on different aspects of water resources at one point, in addition to India-WRIS (Water Resources Information System) already developed at CWC. NWM has identified 8 river basins (viz. Mahanadi, Mahi, Luni, Tapi, Sutlez, Sabarmati, Subarnarekha and western flowing rivers from Tadri to Kanyakumari) for study of impact of climate change in association with research institutes like IITs, NITs, IISc and NIH under the R & D scheme of the Ministry. Further, studies

on all the river bodies of the country is planned through statistical and dynamic downscaling of global climate change models.

5.5 When further asked about the updated status of the proposed study of impact of climate change identified by NWM of 8 river basins in association with IITs, NITs, IISc and NIH, and by statistical and dynamic downscaling of global climate change models, the Ministry submitted as under:

“Studies on impact of climate change on water resources for seven river basins (Mahanadi, Mahi, Luni, Tapi, Sabarmati, Subarnarekha and western flowing rivers from Tadri to Kanyakumari) in association with research institutes like IITs, NITs, IISc. and NIH have been approved under the Research and Development scheme of the Ministry. A study on statistical downscaling of global climate change models for the river basins has also been approved in 2016. The work has been awarded to the project implementing agencies. The R and D scheme is planned and being implemented by the Planning and Policy Wing, MoWR, RD and GR.

NWM in association with the Asian Development Bank (ADB) has completed the study “Operational Research to support mainstreaming of integrated flood management under climate change” with focus on community participation. Two pilot studies have been completed for Burhi Gandak basin in Bihar and Brahmani-Baitarani basin in Odisha. The project reports have been sent to State Governments for taking necessary action/implementation.”

**(b) National Water Mission and Citizen and State Action on water conservation, augmentation and preservation**

5.6 As per information received from the Ministry, the National Convention of Water Users Associations (WUAs) was held at New Delhi in November, 2014 and three Regional Conventions aimed at “promotion of citizen and state action for water conservation, augmentation and preservation” were organised at Ludhiana on 25-26<sup>th</sup> August, 2015, at

Aurangabad on 8-9<sup>th</sup> January, 2016 and at Bengaluru on 24-25<sup>th</sup> September, 2016 respectively, which the Ministry stated, have yielded the following outcomes:

- (a) “Capacity building of representatives of WUAs on PIM, water conservation and improving water use efficiency.
- (b) Identification of problems faced by WUAs by taking feedback and group discussions.
- (c) Made a number of recommendations.

Under the Command Area Development (CAD) programme of MoWR, RD & GR about 84,799 water user associations have been set up for community management of canal command areas.”

**(c) National Water Mission and Training, Capacity-building and Awareness Programmes**

5.7 The Ministry informed the Committee that the NWM has entered into MoU with TISS (Tata Institute of Social Science), Mumbai, NIRD (National Institute of Rural Development), Hyderabad and other institutes to undertake sensitization, training and capacity building programmes in water resources management, augmentation and conservation. NWM has prepared Guidelines for organizing HRD/training/capacity building/mass awareness programmes, and 25 training capacity building/mass awareness programmes have been organized to address various strategies during 2015-16. Further, a training policy has been developed by NWM to undertake capacity building exercise of farmers, WUAs and field officials in water resource and agricultural sectors.

5.8 The Committee wanted to know whether the guidelines prepared by NWM for organising HRD/training/capacity building/mass awareness programmes have been circulated to the States/UTs and about their responses thereof so far. To this query, the Ministry replied as follows:

“NWM guidelines for organizing HRD Capacity Building were circulated to the Central/State Government organizations like Water and Land Management Institutes (WALMIs) in May, 2016.

The following institutes submitted the proposals for undertaking training and capacity building/mass awareness programmes on water conservation during the financial year 2016-17:

**Table – 6: Institutes which submitted proposals for training and capacity building / awareness programmes on water conservation during 2016-17.**

Sl. No	Organization	Nature of Training/Workshop/Mass Awareness	No. of Programme
1	NERIWALM, Tezpur	IWM for WUAs, women & self help groups	4
2	IGNP, Bikaner	Capacity Building / Mass Awareness Programmes on IWM	4
3	India Network for PIM, New Delhi	Regional Conventions on PIM for WUA Presidents at Bangalore, Eastern Regions	2
4	WALMI, Aurangabad	Workshops/Trainings on WUE in IWM	7
5	HIRMI, Kurukshetra	Trainings on WUE for farmers	1
6	NIRD&PR, Hyderabad	Trainings / workshops on PIM, Basin level IWM, WRM of over exploited areas, WUE for water resource system and PIM	4
7	NIH, Roorkee	Brain Storming Session on impacts of climate change on water resources	5
8	WALAMTARI, Hyderabad	WUE, Water Management & Rainwater Harvesting	7
9	CWPRS, Pune	National Seminar on Water Environment (in Hindi)	1
	WUE- Water use efficiency, IWM- Irrigation Water Management WUA – Water User Association PIM – Participatory Irrigation Management		

55 training and capacity building programmes were organized in association with various organizations and about 4,420 persons trained during 2015-16 for various



stakeholders, such as, Government officials/ water users association/ farmers and NGOs working in water sector.

**(d) National Water Mission and Efforts on increasing Water Use Efficiency**

5.9 The Ministry also stated that to achieve the goal of “increasing water use efficiency by 20%”, the NWM has proposed to undertake demonstration project proposals in water sectors namely, irrigation, industry, domestic water supply and re-cycle and re-use of water. These demonstrative projects shall be aimed at increasing water use efficiency in different water sectors including state-of-the-art technologies. NWM has identified the six irrigation projects for preparation of DPR, which shall be undertaken after availability of additional funds.

**Table – 7: 6 Demonstrative Irrigation projects identified by NWM for preparation of DPRs**

Sl. No.	State	Project
1.	Telangana	Kaddam Project (CCA-27519 ha.)
2.	Maharashtra	Khekranala Project (CCA-3810 ha.)
3.	Rajasthan	Chambal Project (CCA-229000 ha.)
4.	Rajasthan	Indira Gandhi Nahar Project stage II, (CCA-320000 ha.)
5.	Punjab	Project for renovation of Kokari distributary, Abohar Branch, Sirhind Canal System (CCA-28756 ha.)
6.	Haryana	Project for renovation of the Hisar Major Distributary Sub-system of the WJC system (CCA-21270 ha.)

5.10 Asked by the Committee about the progress of the 6 demonstrative irrigation projects identified by NWM for preparation of DPRs, the Ministry replied as follows:

“National Water Mission (NWM), MoWR, RD & GR have identified six Demonstrative Irrigation projects for preparation of Detailed Project Reports (DPR) under Goal No. IV titled “Increasing Water Use Efficiency by 20 % in six states viz. Telangana (Kaddam Project), Maharashtra (Khekranala Project), Rajasthan (Indira Gandhi Nahar Project), Punjab (Kokri Distributary - Abohar Branch, Sirhind Canal System), Haryana (Hissar Major Distributary sub-system of West Yamuna Canal System) and Madhya Pradesh

(Chambal Canal Project). NWM has requested the respective State Governments to notify the Nodal Officers for these projects. Two State Governments (Punjab and Rajasthan Irrigation Departments) have nominated the nodal officers. The responses from other states are awaited. The targets are to be fixed in consultation with the concerned State Governments.

NWM has awarded a demonstration project work to National Institute of Hydrology (NIH), Roorkee, namely, Grey water to blue water - Natural Treatment Techniques for Transforming Wastewater into Sustainable Useable Water” in 2016. The project is being implemented in association with IIT, Mumbai, Uttrakhand Jal Sansthan (UJS) and NIH, Roorkee.”

5.11 The Ministry also informed the Committee that the ‘National Bureau of Water Use Efficiency’ (NBWUE) has been proposed to be set up under NWM. When queried about its status, the Ministry submitted:

“The NBWUE draft proposal was prepared in NWM and approved by the Hon’ble Minister (WR, RD & GR). The proposal was forwarded to the PMO and the cabinet secretariat as advance copy in June 2016. The PMO vide I.D note dated 10.08.2016 made the observations: “In light of the discussion held during the meeting chaired by Principal Secretary to the Prime Minister on 28.07.2016 the proposal is returned so as to take appropriate action as part of integrated Water Management Efforts.

Ministry of Water Resources, River Development and Ganga Rejuvenation has taken a number of activities related to improving water use efficiency/water conservation.

*Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)* to ensure access to some means of protective irrigation to all agricultural farms in the country to produce ‘per drop more crop’. The guidelines for PMKSY have been revised to cover 10% of the command area under efficient irrigation system (drip/sprinkler system). The main components under PMSKY are:

(a) Accelerated Irrigation Benefit Programme (AIBP)- completion of on-going 99 Major Medium Irrigation (MMI) projects to realize an irrigation potential of 76 lakh hectares in a mission mode.

(b) Har Khet ko Pani -Minor Irrigation (both surface and ground water); Repair, Restoration and Renovation of water bodies; Command Area Development; Improvement in water management and distribution system; Ground water development; Creating and rejuvenating traditional water storage systems . To restore and augment storage capacities of water bodies, and also to recover and extend their lost irrigation potential.

1. A scoping study for a National Water Use Efficiency Improvement Support Program for Major/Medium Irrigation Projects has been completed with technical assistance from Asian Development Bank (ADB). Two pilot projects, Dharoi Irrigation Project in Gujarat and Sanjay Sarovar Irrigation Project in Madhya Pradesh, have been taken up under Phase-II of the study.

2. Baseline studies of 21 major/medium water resource projects to assess the present status of water use efficiency have been initiated in March, 2016 in the states Assam, Manipur, Andhra Pradesh, Telangana and Maharashtra in association with Water and Land Management Institutes (WALMIs).

NERIWALM, Tezpur – 5 irrigation projects in the North-East region (Manipur, Assam).

WALAMTARI, Hyderabad - 10 irrigation projects (5 in Telengana and 5 in Andhra Pradesh).

WALMI, Aurangabad – 6 irrigation projects in the State of Maharashtra.

3. National Water Mission, MoWR, RD & GR has awarded a study on establishing benchmarks for industrial water use to assist policy for enhancing industrial water use efficiency in India to The Energy and Research Institute, New Delhi. The study would focus on scoping exercise, preliminary baseline assessment of water & comprehensive water audit/ benchmarking in two industrial sectors i.e. Thermal power plants & textile industries.”

## PART II

### OBSERVATIONS / RECOMMENDATIONS

#### LOW PER CAPITA WATER STORAGE AND AVAILABILITY IN INDIA

1. The Committee note that the per capita live water storage in India is about 209 m<sup>3</sup> (cubic meters) based on population of 2011 census, which is far below 1000 cubic meters, the minimum threshold for identifying water-scarcity condition of a locality, State or country. The Committee also note that as per the information provided by the Ministry of Water Resources, River Development and Ganga Rejuvenation, Russia and Australia can sustain consecutive droughts for about 4 and 3 years respectively. However, India cannot sustain drought beyond one non-Monsoon season due to low per capita storage, and as such, thus may face acute stress, if any year happen to be a drought year. Further, whereas the average water availability in the country remains more or less fixed according to the natural hydrologic cycle, the per capita availability is reducing progressively owing to increasing population, from 2209 cu. m. (cubic meter) per year in 1991 to about 1545 cu. m. per year in 2011. The Committee note with concern that the country is steadily hurtling towards a great water crisis in the near future due to the prevailing near water-scarcity situation in the country as well as the regressive trend towards declining per capita water availability, specially since 1991. The Committee, therefore, recommend that urgent, specific initiatives be made by the Government to increase the live per capita water storage as well as per capita water availability in India. In this connection, the Committee note the Ministry's observation that creation of storage-based water resources projects on appropriate sites can result in increased per capita live storage capacity - without compromising the ecological balance in the

country. The Committee therefore, strongly recommend the Government to (i) compile information / data regarding the large and medium dams / reservoirs presently under implementation in the country separately, (ii) make a review of the status of their execution including the bottlenecks (if any) hampering the timely completion, and (iii) make a time-frame for completion of each of these large/medium dams or reservoirs. The Committee desire to be apprised of the initiatives taken by the Government in this regard.

#### **DECLINE IN GROUND WATER LEVELS**

2. The Committee note that in certain areas of India, there has been (i) increase in pumping depths, drastic reduction in wells / tube wells yields and enormous rise in the cost of pumping ground water, (ii) widespread and acute scarcity of ground water in summer months for irrigation and drinking uses, and (iii) increase in fluoride content in certain areas and increase in salinity in the coastal areas. As per data compiled by Central Ground Water Authority (CGWA), there are 90% blocks in Punjab where ground water have been extracted and also that 'Water' being a State subject, 100% subsidy on power in Punjab is being provided to the Agriculture Sector, despite the fact that the Kirit Parikh Committee Report (2010) had suggested that water should not be treated as such - being a common resource. The Committee are further to note that perturbed that in Punjab, out of 138 assessment units, 110 have been classified as 'Over-exploited', 4 'Critical', 2 'Semi-Critical' and 22 'safe' as per the Ground Water Resource Estimate Report, 2011, one of the major reasons for which is being attributed to shifting to water intensive crop in the State, which has resulted in depletion of ground water table in many parts due to over-exploitation, imposing financial burden on farmers - who need to

deepen their wells and replace their pump sets and on State Governments - whose subsidy burden for electricity supply increase due to the provision of free electricity in the State for agricultural connections. The Committee are convinced that a major factor responsible for the scenario has been the absence of a clear-cut policy on ground water extraction till now. The Committee, therefore, reiterate the recommendation (no. 6) contained in their 5<sup>th</sup> Report (16<sup>th</sup> Lok Sabha on “Review of Ground Water Scenario, need for a comprehensive policy and measures to address problems in the country with particular reference to (i) Dark Blocks; and (ii) Contamination of underground water by certain industries” viz. that the Government should come out with a well-defined policy on ground water extraction. The practice of free supply of electricity to farmers for extraction of ground water be regulated with proper accountability by the States. The Committee of the considered view that an expert panel needs to be set up by the Government for making a scientific study of the impact of excessive withdrawal of ground water due to paddy cultivation in the State of Punjab – which should also suggest remedial measures to address the issue of wasteful draft of water for agriculture in the entire country. The Committee would like to be apprised of action taken in this regard.

### TRADITIONAL WATER RECHARGE / HARVESTING PRACTICES

3. The Committee observe from the information provided by the Ministry that India had a rich tradition of water harvesting, which is more than two millennia old, viz. the Kuhals of Jammu, Kuls of Himachal Pradesh, Guls of Uttarakhand, Pats of Maharashtra, Zings of Ladakh,, Zabos of Nagaland, Eris of Tamil Nadu, Keres of Karnataka, Tankas / Kundis / Bawdis / Jhalaras, etc. of Rajasthan. Sadly, however, these age-old traditional

rain-harvesting systems have fallen into disuse with the introduction of piped water supply system. In this connection, the Committee, further note that when the information pertaining the status of indigenous water harvesting methods / practices in India including their contribution to water resources conservation and management was sought, the Ministry have replied that about 6 lakh tanks / storages in India are used for minor irrigation (MI) schemes as per 4<sup>th</sup> Minor Irrigation Census, out of which 5 lakh are in use at present. The Committee also categorically desired to know whether any study has been made so far regarding the efficacy, merits, viability or sustainability of traditional water recharge / harvesting techniques and also to state the efforts made by the Government to preserve, improve and develop the indigenous water recharge / harvesting methods in India. To this query, however, the Ministry have not furnished the relevant reply but have merely cited the various objectives of the scheme of Repair, Renovation and Restoration (RRR) of Water Bodies being implemented by the Government of India since the 10<sup>th</sup> Plan. The Committee deplore the cavalier attitude of the Ministry, and they recommend that the Ministry immediately take steps to institute a panel of experts, professionals drawn from various reputed institutions in the country for undertaking a study on the efficacy, merits, viability or sustainability of traditional water recharge / harvesting techniques in India as existing now and apprise the Committee of the findings of their study. The Committee also desire that the Ministry hold consultations with various States / UTs with a view to devise ways and means to preserve, improve and develop indigenous water recharge / harvesting methods in the country that have fallen into disuse for various reasons. The Committee would like to be updated about action taken in this matter.

## **MODERN WATER CONSERVATION TECHNIQUES – DRIP AND SPRINKLER SYSTEMS**

**4. The Committee observe that Drip and Sprinkler irrigation systems constitute the chief modern water conservation techniques in India. In Drip irrigation, water is delivered at the root zone of the crops through emitters like drippers, micro sprinklers, micro jets, misters, fan jets, micro sprayers, foggers, etc. This method has less water requirement resulting in water saving, higher fertilizer application efficiency, energy conservation, higher water use efficiency, and is feasible in different terrains and suitable for problematic soils and prevention of water logging. Sprinkler irrigation system requires energized pump sets, irrigate more uniformly than gravity systems, require much less maintenance when compared with conventional pressurized irrigation systems, eliminates seepage and evaporation losses, has no requirement of skilled manpower, no expensive land levelling, and is suitable for irrigation of crops with high density and particularly effective in sandy undulating terrains and widely used for cereals, pulses, seeds and other field crops. The Committee are happy to note that State Governments are encouraging adoption of these water saving techniques through provision of subsidies to farmers on purchase of these systems. The Committee further note that as per the 12<sup>th</sup> Plan guidelines of Command Area Development and Water Management (CAD&WM) programme, a minimum of 10% of Culturable Command Area (CCA) of each project is to be covered through micro irrigation and the Central Assistance to the tune of 50% is provided to the States for development of infrastructure to facilitate use of sprinkler / drip irrigation. The Committee also note that through 'fertigation' process in sprinkler / drip irrigation systems, more efficiency is achieved by combining fertiliser as well as water soluble fertilizers, thereby increasing fertilizer use**



efficiency from 80 to 90 per cent. Taking cognizance of the paramount need for conservation of water in India through traditional as well as modern methods, the Committee desire that micro irrigation comprising Drip and Sprinkler irrigation techniques be taken up in the country as a popular movement with a great sense of urgency by both the Central and the State Governments and proactive action needs initiated by the Government in this regard. The Committee also recommend that apart from the provision of incentives provided through CAD&WM programme by the Government, the Ministry should also come up with novel initiatives to incentivise the States/UTs to adopt Sprinkler and Drip irrigation systems for achieving water use efficiency in agriculture and other allied sectors of the country without loss of further precious time, and also take steps to promote 'fertigation' across the country. They would further strongly recommend the Government to promote and propagate Drip and Sprinkler irrigation methods through the print and electronic media such as television, cinema, internet etc. so as to create necessary awareness among the farming community as well as general public. They would like to be apprised of the progress made in this direction through the initiatives taken by the Ministry.

#### **AQUIFER MAPPING**

5. The Committee note that under the National Aquifer Management (NAQUIM) programme initiated since 2012, only an area of 5.5 lakh sq. km. has so far been mapped and 23 lakh sq. km. remain to be mapped, for which Rs. 3000 crore is needed. The reason for under-achievement in the implementation of NAQUIM programme, according to the Ministry, was delay in commencement of the programme due to late approval of the scheme in September, 2013. The Ministry also informed that NAQUIM programme

has been taken up in 8.89 lakh sq. km. during 12<sup>th</sup> Plan, focussing on ground water over-exploitation, water scarcity in Bundelkhand and arsenic contamination and that out of 8.89 lakh sq. km., an area of 5.25 lakh sq. km. has been re-prioritized in the water stressed areas of the States of Haryana, Punjab, Rajasthan, Gujarat, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, NCT Delhi and Bundelkhand region for aquifer mapping and preparation of aquifer-wise ground water management plans. The Committee have also been apprised that (i) review of the work done under NAQUIM programme is being carried out at CGWB through a two-tier evaluation mechanism, (ii) regular progress is being reviewed at Ministry-level including the weekly meeting taken by Minister of Water Resources, River Development and Ganga Rejuvenation, (iii) State Ground Water Coordination Committees (SGWCC) are geared up as per direction of National Inter-Departmental Steering Committee (NISC) for Aquifer Mapping and Management Programme, and (iv) workshops are being organised by CGWB involving Central / State Government departments, academic institutions, experts, etc. to have regular feedback on activities being carried under NAQUIM. Despite these tall claims, the Committee are disappointed that although a total outlay of Rs. 3319 crore has been made for 12<sup>th</sup> Plan (2012-2017) for the scheme of Ground Water Management and Regulation with Aquifer Mapping as one of the components, a total expenditure of only Rs. 146.48 crore has been made on Aquifer Mapping upto June, 2016. The Committee are convinced that special measures are desperately needed to ensure smooth progress in the implementation of NAQUIM programme in the country. Noting that the 12<sup>th</sup> Plan (2012-17) is soon coming to an end without commensurate achievements being made under NAQUIM in the country, the Committee desire that they be apprised of the

physical and financial achievements made under NAQUIM in 5.25 lakh sq. km. re-prioritised, water-stressed areas till date. They also desire that effective measures / methods be devised and put in place by the Government to ensure timely, optimum utilization of budgetary outlays made for Aquifer Mapping under the scheme of Ground Water Management and Regulation before the end of the 12<sup>th</sup> Plan period. Additionally, the issue of late approval of the National Aquifer Management (NAQUIM) programme be addressed on priority so that this problem at least do not plague its implementation during the ensuing 13<sup>th</sup> Plan, if the scheme is proposed to be carried over further. In the opinion of the Committee, the monitoring and evaluation works of the programme also needs to be intensified by the Government during 2017-18 in order to speed up its implementation and achieve targets-oriented results.

#### **GROUND WATER IMPROVEMENT PROGRAMME**

6. The Committee observe that a Central sector scheme called 'Ground Water Improvement Programme' is proposed to be launched shortly by the Government with budgetary support from the Central Government and loan from the World Bank in the ration of 50:50. Subject to approval by the Ministry of Finance and the Union Cabinet, the scheme is to be of six years duration, and would have inherent linkages with National Hydrology Project (NHP) and National Aquifer Management (NAQUIM) programme. Initially, five States, viz. Rajasthan, Haryana, Maharashtra, Gujarat and Karnataka, having some of the most heavily exploited ground water areas in India confronting serious water availability and quality issues, have been selected for inclusion in the Scheme, which also has provision for social audit and third party verification. Given the serious ground water scenario prevailing in the country, the

Committee recommend the Government to ensure that the 'Ground Water Improvement Programme' as proposed is launched in the aforesaid six States of the country without further delay by obtaining necessary approval / clearance for it from the Ministry of Finance and Union Cabinet. The Committee also desire the Government to ensure that the modalities of implementation, detailed model of funding, approval of the specific projects to be included under the Programme, monitoring and evaluation system of the scheme be worked out at the earliest and be forwarded to the States for eliciting their responses. Additionally, the Committee also recommend that apart from these six States, the Ministry should explore ways and means to include the other remaining States in 'Ground Water Improvement Programme' in due course. The Committee desire to be apprised of progress made in the matter, after the presentation of this Report to the House.

## **WATER BUDGETING**

7. According to the Minister of Water Resources, River Development and Ganga Rejuvenation, 'water budgeting' is an accounting of all the water utilized by the system that flows into and out of a project area. Based on the availability of water as per the rainfall data, allocation of water to various sectors (irrigation/agriculture/domestic/industrial) is made for the year specially for Rabi and Kharif crops. The Ministry also informed that proper water budgeting is helpful to conserve water from rainfall and surface run off to the extent possible in view of the erratic and highly variable duration and amount of Monsoon rainfall in different parts of the country. In this connection, the Committee note that the National Water Mission (NWM) has requested all the States / UTs to prepare State Specific Action Plan (SSAP)

for water sector linking with State Action Plans for Climate Change, as a result of which six States, viz. Andhra Pradesh, Assam, Gujarat, West Bengal, Uttarakhand and Telangana have initiated their State Specific Action Plans in the first phase and other States are to follow. The Committee also note that State / UT Governments have been asked to set up Water Regulatory Authorities to regulate the use of water and promote water conservation, and the Governments of Maharashtra and Gujarat have established such Authorities in their respective States. Having fully convinced that 'water budgeting' is an efficacious technique for judicious and efficient use of water in the country, the Committee strongly recommend that appropriate guidelines be issued by the Government to all States/UTs, Central Institutions/bodies and local bodies to promote and popularize the concept of 'water budgeting' all through the country, and necessary steps be immediately initiated by the Ministry in this direction under intimation to this Committee. The Committee also recommend that the Ministry vigorously pursue with all the remaining States/UTs to prepare State-Specific Action Plan (SSAP) for water sector by linking them with State Action Plans for Climate Change - in compliance with the goal of National Water Mission within a specified time-frame. Side by side, steps be taken by the Government to ensure that all the other remaining States/UTs duly set up Water Regulatory Authorities for regulation of the use of water and also its conservation on the pattern already done in the States of Maharashtra and Gujarat, and also targets to achieve thereby be set up by the Government for compliance by all the States/UTs. The Committee would like to be informed of further action taken in this regard.

## WATER USE EFFICIENCY

8. The Committee observe that for improving water conservation, the Central Water Commission (CWC) of Ministry of Water Resources, River Development and Ganga Rejuvenation has been keeping eye on performance overview and management improvement of Major and Medium Irrigation (MMI) projects of the country. It has so far appraised water use efficiency of 35 irrigation projects and 131 performance evaluation studies and the findings therefrom were conveyed to the respective project authorities for taking up corrective measures. The CWC has also been encouraging water auditing and benchmarking of irrigation projects by publishing general guidelines for it for the States as also the Guidelines for improving water use efficiency in irrigation, domestic and industrial sectors. The Committee further note that under the 'Per Drop More Crop' component of the Prime Minister's Krishi Sinchai Yojana (PMKSY), promotion of efficient water conveyance and precision water application, installation of devices like drips, sprinklers, pivots and rain-guns in the farms is envisaged. The Committee are convinced that the time has come for the Government to adopt proactive steps to promote water use efficiency in the country, specially in the agricultural sector. They, therefore, recommend that additional Major and Medium Irrigation projects apart from the 35 irrigation projects already undertaken, may be taken up by the CWC for performance appraisal and overview in regard to water use efficiency during 2017-18. Noting further that 131 performance evaluation studies and their findings pertaining to irrigation projects were already conveyed to the respective Project Authorities for taking up corrective measures, the Committee urge the Ministry not only to undertake and forward performance evaluation studies of Major and Minor Irrigation projects but also

to endeavour to obtain relevant feedback from the concerned Project Authorities for perusal. The Committee are also fully convinced that with the general increasing trends towards water scarcity in the country in the present times, it is pertinent to think that the time has come for the country to go for bold initiatives toward the irrigation practices, and they, therefore, strongly recommend that the Ministry / Government institute a study on the viability of introducing piped-water supply to the fields - which will definitely reduce losses in water conveyance losses in canals, reduce water-logging and ensure water availability to tail-end farmers as well on a large-scale. The Committee further desire that performance evaluation (State/UT-wise) regarding the physical and financial achievements under PMKSY till date be made by the Ministry / Government and the results achieved thereby be furnished to them at the earliest.

#### **WATER USERS ASSOCIATIONS**

9. The Committee note the Ministry's observation that unless the water users / Water Users Association (WUAs) are sensitized for efficient water use practices and roped in for water conservation, the on-ground improvement is a bit difficult, which thereby underlines the need to have lucrative incentivizing provisions to make them active stakeholders rather than the end users. The Committee fully concur with the view of the Ministry on this issue, and they strongly recommend that the Ministry bring out a Model Bill to be adopted by all States / UTs, which would provide legal framework for enactment of Participatory Irrigation Management (PIM) by them. The Committee also desire that the Ministry immediately enter into consultations with all the States/UTs for ensuring the enactment of PIM expeditiously in their respective territories providing for formation of a robust, efficient network of Water Users Association (WUAs) all over the

country. The Committee would further like to be updated about the status of participatory approach to management of water resources, i.e. enactment of PIM legislation and formation and functioning of WUAs in different States/UTs of the country. They also strongly recommend that a periodic monitoring and review mechanism on the working and performance of WUAs be worked out by the Ministry so as to eliminate the shortcomings noticed in their functioning, if any.

#### COMMAND AREA DEVELOPMENT AND MANAGEMENT

10. As per the Ministry of Water Resources, River Development and Ganga Rejuvenation, a minimum 10% of Cultural Command Area (CCA) of each project is to cover through micro irrigation under the 12<sup>th</sup> Plan guidelines. Further, Central Assistance (CA) to the tune of 50% is provided to the States for development of infrastructure to facilitate use of sprinkler / drip irrigation systems as an alternative to on-farm development works. Three schemes have been sanctioned in respect of micro irrigation works in 12<sup>th</sup> Plan, viz. Development of pressure irrigation in command area of six lift schemes of Indira Gandhi Nahar Pariyojana (IGNP), Stage-II, Rajasthan, Kandi Canal CAD&WM project, Punjab, and Kotla Branch, Part-II, Punjab. Whereas CA of a mere Rs. 10.85 crore and Rs. 4.01 crore have been released in respect of six lift irrigation schemes under IGNP, Stage-II (Rajasthan) and Kotla Branch, Part-II, (Punjab), no such release has been made for Kandi Canal CAD&WM project (Punjab) although 12<sup>th</sup> Plan is shortly coming to an end, which speak volumes about the casualness with which the execution of the CAD&WM projects / schemes are being done by the Government. The Committee, therefore, strongly recommend the Government to take immediate steps for



release of the full amount of estimated Central Assistance for each of the three CAD&WM projects / schemes within this financial year (2017-18), viz. six lift schemes of IGNP, Stage – II, Rajasthan (Rs. 1658.80 crore) Kandi canal CAD&WM project, Punjab (Rs. 73.44 crore) and Kotla Branch, Part-II project, Punjab (Rs. 38.325 crore) and apprise them of action taken in this regard. The Committee also note that the Central Water Commission have undertaken 35 (thirty-five) studies to make a realistic assessment of water use efficiency for completed major / medium projects under Plan scheme of the Ministry, the recommendations / results of the study reports about interventions required / step to be taken up, have reportedly been sent to the concerned State Governments for taking necessary action. The Committee would like to know the specific follow-up action taken by the concerned States where such recommendations / results of study reports had been sent by the Government, and they also desire that the Ministry impress upon these State Governments to accord priority to taking the required remedial action for each of these projects. They would also desire the Ministry to take new initiatives with the States for improving water use efficiency in the form of guidelines / directives which would broadly include these measures, i.e. volumetric measured supply of water at field levels to be monitored by WUAs, levy of certain minimum water tariff to discourage wasteful water withdrawal from irrigation systems, enactment of PIM Act with empowerment of Water Users' Associations (WUAs), proper maintenance and management of surface water irrigation system so as to give an assured water supply for each field of the command area. The Committee would like to be apprised of action in this regard.

## CLIMATE CHANGE AND WATER CONSERVATION

11. The Committee observe that the Ministry of Water Resources, River Development and Ganga Rejuvenation have initiated 'Climate Change, Impact Study on Eight River Basins' which would assess the impact of climate change on water resources specially on eight river basins of the country and global models are to be statistically and dynamically to be downscaled in the range of 30 years, 50 years and 100 years from now, and assessing that can help in framing of plan for the conservation of water. Accordingly, study proposals have been invited from reputed academic institutions like IITs, NITs, IISc, NIH, etc. for eight river basins, viz. Mahanadi, Luni, Tapi, Satluj, Subarnarekha, Sabarmati, Mahi and areas of inland drainage, Tadri to Kanyakumari river basin. The duration of the studies would vary from 2 to 3 years. The Committee strongly feel that the threat to climate change is now considered as an established fact. The Committee are happy to note the Ministry's reply that research studies have been initiated on assessing impacts of climate change specially on water resources and on different adaptation and mitigation approaches, which would contribute to water sector in several ways, viz. (i) the regional climate scenarios will guide the policy makers for future planning, (ii) the modelling results will provide estimate of the future water availability in the basin , and (iii) the model results might be used for assessing the effectiveness of the existing flood fighting structures and other infrastructures like bridges, weirs in the area under the flooding condition, (iv) performance of reservoirs would be evaluated to assess the impact of climate change and adaptation measures will be suggested, and (v) the adaptation strategies will help the local population to minimize the risk due to changing climate. The Committee urge the Ministry to tackle the issue of

the impact of climate change on water resources conservation in the country with all seriousness, and they, therefore, recommend the Ministry to enlist support from not only the academic institutions but other NGOs/individual experts well-versed in the subject so that a pragmatic solution could be found to meet the adverse effects of climate change on water resources conservation. The Committee also urge the Ministry to get the studies on “Climate Change, Impact Study on Eight River Basins” and related research studies initiated by it and completed in a time-bound manner, which would serve as a catalyst for the Ministry to evolve measures aimed at holistic conservation of India’s water resources. They desire to be informed of the action taken in respect of the above.

#### **CROPPING PATTERN AND WATER CONSERVATION**

12. The Committee note the Ministry’s reply that change of cropping pattern by farmers, specially from less water demand crops to high water demands crops such as sugar cane and paddy induces failure of the designed irrigation system to irrigate the entire command area, resulting in the tail-end farmers being deprived of irrigation water. Hence, it is necessary to enforce the proposed cropping pattern in the project area for effective management of water so that each field in command could get adequate water. The Committee also note that State Governments are encouraging adoption of water-saving technologies, such as sprinkler and drip irrigation systems, through provision of subsidies to the farmers on the purchase of these systems, which are also recommended for achieving higher irrigation efficiencies and could be used for very small-sized holdings. However, the adoption of these technologies by poor farmers would depend heavily on the supply of information, material and service for installation.

In this connection, the Committee note that para 6.5 of the National Water Policy, 2012 contains provision which stresses water saving in irrigation use, viz. “water saving in irrigation use States is of paramount importance. Methods like aligning cropping pattern with natural resources endowments, micro irrigation (drip, sprinkler etc.), automated irrigation operation, evaporation – transpiration reduction, etc., should be encouraged and incentivized.” Keeping in view the fact that the bulk of farmers in India are poor who may not be in a position to avail of the tools for water-saving technologies, the Committee desire the Ministry to devise innovative steps to incentivise the farmers for adoption of these water-saving technologies in a big way, and also to explore avenues for encouraging farmers to stick to the agreed cropping pattern for effective water management so that each field in the command area including tail-end farmers get adequate water supply throughout the year. Assuming further that adequate finances may not be available either with the States/UTs or farmers, the Committee also recommend the Government to encourage private sector participation in agriculture and water resources sector specially in the micro irrigation. The Committee also desire the Ministry to make a study on the impact of cropping pattern on water conservation in the country with the help of individual experts / professionals and research institutes under the Government for identifying the shortcomings noticed and advising solution so that the results of such a study may be disseminated to the States/UTs, farmers, water users, etc. for their benefits. The Committee would like to be informed about the action taken in this regard.

## **PARTICIPATORY GROUND WATER MANAGEMENT IN MAHARASHTRA**

**13. The Committee are informed that the village community in the three (3) districts of Satara, Jalna and Beed in Maharashtra had successfully adopted efficient irrigation practices, change in cropping pattern from sugar to low water-consuming crops on the demand side and also adopted artificial recharge to enhance the yield of aquifer completing 116 recharge structures (55 in Satara, 30 in Jalna and 31 in Beed). The aquifer-based participatory ground water management pilot projects in these three districts was undertaken under Maharashtra Water Sector Improvement Project (MWSIP), aided by World Bank, and implemented in a total of 52 villages of these districts within the tenure from 2005 to 2013 with the State Government playing a crucial role and initiating project activities with the mapping and delineation of the aquifer in the selected areas and then preparing the aquifer based water balance of the project area with community participation and with facilitation of a non-Governmental Organisation (NGO). The local community in each village was organised into Gram Panchayat Level Committees (GPLCs), having their own by-laws, whose Executive Committees were elected through democratic elections. All the GPLCs in the project pilot aquifer area after their formation, were federated into Ground Water Management Association (GWMA). The GPLCs and GWMA deliberated on current ground water situation and adopted appropriate intervention to improve ground water efficiency, reduce ground water extraction and arrest declining of water levels. The community manages aquifer with the help of NGO as per the Ground Water Management Action Plan (GWMAP) under the technical supervision of District Technical Support Group composed of officers from various disciplines and Departments like water resources, water supply, agriculture and**

**GSDA. Based on the capacity of the aquifer and availability of surplus runoff, the artificial recharge structures were finalized. The Committee are happy to know that the same aquifer based participatory ground water management is being replicated in ‘Jal-swarajya’ project (of Maharashtra Rural Water Supply and Sanitation Department) - which is being implemented in 7 districts of the State, and that the same model is being propagated through the Maharashtra Ground Water (Development and Management) Act, 2009, which came into force w.e.f. 1<sup>st</sup> June, 2014. The Committee have also been apprised of the successful implementation of ground water management by community participation / Gram Panchayat in Hiware Bazar, Ahmednagar district, Maharashtra having a population of 1233 (2011), which was achieved through water budgeting leading to change in cropping pattern and use of Drip/Sprinkler irrigation on the demand side and construction of rain water harvesting, e.g. earthen bunds, percolation tanks, stone bunds, check dams, trenches etc., afforestation and protection recharge zones, and revival of water bodies on the supply side. The Government of Maharashtra was involved in providing the needed infrastructure facility, capacity building, data generation for water budgeting. This data was used for participatory ground water management with active involvement of villagers as per the decisions of the Gram Sabha. The Committee are heartened to note that the initiatives under participatory ground water management at Hiware Bazar, Ahmednagar, Maharashtra have greatly improved the socio-economic conditions of the village, and the village was declared an ‘Ideal Village’ by the Government of Maharashtra and, while during 1992, there were 168 families Below Poverty Line (BPL). But by 2008, there was not a single BPL family left. The Committee recommend the Government to earnestly explore the viability of**

replicating such models in the other remaining States/UTs so that concrete improvements are visible on ground water front in the near future, specially in those States/UTs facing ground water over-exploitation, water scarcity and arsenic / fluoride contamination – areas having serious ground water availability and quality issues. The Committee would like to be apprised of initiatives taken by the Government in this regard.

#### **NATIONAL WATER MISSION AND STUDY OF IMPACT OF CLIMATE CHANGE ON WATER RESOURCES**

14. The Committee observe that to achieve the goal for “comprehensive water data base in public domain and assessment of the impact of climate change on water resources” 878 Hydrological Observation Stations (HOS) have been established in different basins, and 800 new HOS have been targeted to be established by Central Water Commission (CWC) in 12<sup>th</sup> Plan. The Committee also note that CWC has a target of 200 Automatic satellite-based telemetry system for financial year 2016-17 for hydrological network, real time information, improved water resource assessment, planning and flood forecasting, out of which 57 telemetry systems have been achieved upto December, 2016. Besides, the Committee have been informed that studies of impact of climate change on water resources for seven river basins (Mahanadi, Mahi, Luni, Tapi, Sabarmati, Subarnarekha and west flowing rivers from Tadri to Kanyakumari) in association with research institutes like IITs, NITs, IISc and NIH have been approved, and work on a study on statistical downscaling of global climate models for the river basins (approved in 2016) has been awarded. The Committee desire that the Ministry chalk out action plan for achieving the goal of 800 new hydrological stations to be set up by CWC during 12<sup>th</sup> Plan and also the target of 200 Automatic satellite based telemetry

system during 2016-17 as planned by CWC. Further, progress of work pertaining to studies on impact on climate change on water resources for the said seven river system for which work has been awarded to the project implementing agencies, may also be constantly monitored by the Ministry and apprised to the Committee. In addition, the Committee also note that, NWM in association with the Asian Development Bank (ADB) has completed the study “Operational Research to support mainstreaming of integrated flood management under climate change” with focus on community participation, and two pilot studies have been completed for Burhi Gandak basin in Bihar and Brahmani Baitarani basin in Odisha for which the project reports have been sent to State Governments for taking necessary action / implementation. The Committee would like the Ministry to keep tab on the matter so that a tangible outcome emerges from these two pilot studies and an awareness on the impact of climate change on water resources related issues is created in the country as a whole.

#### NATIONAL WATER MISSION AND CITIZEN AND STATE ACTION ON WATER CONSERVATION AND TRAINING, CAPACITY-BUILDING AND AWARENESS PROGRAMMES

15. The Committee note that the National Convention of Water Users Associations (WUAs) was held at New Delhi in November, 2014 and three Regional conventions aimed at “promotion of citizen and state action for water conservation, augmentation and preservation” were organised at Ludhiana on 25-26<sup>th</sup> August, 2015, at Aurangabad on 8-9<sup>th</sup> January, 2016 and at Bengaluru on 24-25<sup>th</sup> September, 2016 respectively wherein several outcomes were noticed, viz. capacity building of representatives for WUAs on PIM water conservation and improving water use efficiency, identification of problems faced by WUAs and recommendations made. The Committee desire that such events be



organized on a permanent basis on rotational basis in every region of the country in order to highlight the need for having a robust WUAs at State levels. The Committee also note that under MoU entered by the NWM with Tata Institute of Social Science (TISS), Mumbai, the NWM has circulated guidelines for organising HRD Capacity building to the Central / State Government organisations like Water and Land Management Institutes (WALMIS) in May, 2016 and 55 training / capacity building programmes have been organised in association with various organisations and about 4,420 persons trained during 2015-16 for various stakeholders, such as, Government officials / water users association / farmers and NGOs working in water sector. The Committee appreciate these initiatives of the Ministry, and they recommend that such training be organised for the elected representatives of the people at the village Panchayat level, such as Sarpanch, village ward members and also Corporators in urban local bodies as well, and necessary initiative be taken by the Ministry in this regard as the earliest.

#### NATIONAL WATER MISSION AND EFFORTS ON INCREASING WATER USE EFFICIENCY

16. The Committee observe that in order to achieve the goal of “increasing water use efficiency by 20%”, the National Water Mission has proposed to undertake proposals in water sector, namely irrigation, industry, domestic water supply and re-cycle and re-use of water, and six (6) demonstrative irrigation projects have been identified for preparation of Detailed Project Reports (DPRs), which shall be undertaken after availability of additional funds, viz. Telangana (Kaddam Project), Maharashtra (Khekranala Project), Rajasthan (Indira Gandhi Nahar Project), Punjab (Kokri Distributory – Abohar Branch, Sirhind Canal System), Haryana (Hissar Major Distributory sub-system

of West Yamuna Canal System), and Madhya Pradesh (Chambal Canal Project). The Committee also note that the NWM had requested the respective State Governments to notify the Nodal Officers for these projects, out of which two State Governments, i.e. Punjab and Rajasthan have done the nomination and the responses from other States are awaited, after which the targets are to be fixed in consultation with the concerned State Governments. The Committee desire the Ministry to pursue with the State Governments of the remaining States, viz. Telangana, Maharashtra, Haryana, and Madhya Pradesh for ensuring expeditious steps in notifying Nodal Officers for the said demonstrative irrigation projects under NWM. They also strongly recommend that specific targets be fixed to achieve the goal of execution of demonstrative irrigation projects by all the concerned six States after holding necessary consultations with them.

The Committee further note that the draft proposal for the setting up of National Bureau of Water Use Efficiency (NBWUE) had been prepared in NWM and the proposal approved by the Minister, Water Resources, River Development and Ganga Rejuvenation was forwarded to the Prime Minister Office (PMO) and Cabinet Secretariat in June, 2016. However, the PMO has returned the proposal on 28.07.2016, with the remark to take appropriate action as a part of Integrated Water Management efforts. The Committee desire to see a clear-cut policy outcome regarding the Ministry's proposal to create NBWUE so that a national framework directives on water use efficiency may be framed at the earliest and issued by the Centre to all the States/UTs in the near future. The Committee also note that baseline studies of 21 major/medium water resources projects to assess the status of water use efficiency was initiated in March, 2016 in the States of Assam, Manipur, Andhra Pradesh, Telangana and Maharashtra in association with Water

and Land Management Institutes (WALMIS) and that NWM has awarded a study on establishing benchmarks for industrial use to assist policy for enhancing industrial water use efficiency in India to 'The Energy and Research Institute', New Delhi, which would focus on scoping exercise, preliminary baseline assessment of water and comprehensive water audit/benchmarking in two industrial sectors, i.e. thermal power plants and textile industries. The Committee desire the Ministry to expedite completion of these studies and apprise them of the outcome. The Committee would, however, also like to be informed of the progress made in this regard.

NEW DELHI  
8 March, 2017  
17 Phalguna, 1938 (Saka)

HUKUM SINGH,  
*Chairperson,*  
*Standing Committee on Water Resources*

**MINUTES OF THE EIGHTH SITTING OF THE STANDING COMMITTEE ON WATER RESOURCES (2015-16) HELD  
ON TUESDAY, 24 MAY 2016**

The Committee sat from 1500 hours to 1630 hours in Committee Room 'D', Ground Floor, Parliament House Annexe, New Delhi.

**PRESENT**

Shri Hukum Singh – Chairperson

**MEMBERS**

**LOK SABHA**

2. Shri Maganti Murali Mohan
3. Dr. Sidhant Mohapatra
4. Shri Rodmal Nagar
5. Shri Sanjay Kaka Patil
6. Shri Vijaysinh Mohite Patil
7. Smt. Aparupa Poddar
8. Shri Vishnu Dayal Ram
9. Smt. V. Sathyabama
10. Shri Lallu Singh

**RAJYA SABHA**

11. Shri Balwinder Singh Bhunder
12. Shri Hanumantha Rao
13. Shri A.V. Swamy
14. Shri Lal Sinh Vadodia

**SECRETARIAT**

1. Shri Shiv Kumar - Joint Secretary
2. Smt. Rita Jaikhani - Director
2. Shri Kushal Sarkar - Additional Director

## WITNESSES

### Ministry of Water Resources, River Development and Ganga Rejuvenation(MoWR,RD&GR)

1. Shri Shashi Shekhar, Secretary
2. Dr. Amarjit Singh, Special Secretary
3. Dr. Amita Prasad, JS (Admn. & GW)
4. Dr. B. Rajender, JS (PP)
5. Shri Jagmohan Gupta, JS&FA
6. Shri R. K. Gupta, JS (Parl.)
7. Dr. M. Satya Narayana, Advisor (C&M)
8. Shri Joginder Singh, Advisor (Tech.)
9. Shri K. Vohra, Commissioner (SPR)
10. Shri Bhupender Singh, SJC (SPR-I)
11. Shri Ravinder Singh, Director (WQ)

### Central Water Commission

12. Shri G. S. Jha, Chairman, CWC
13. Shri R. K. Jain, Chief Engineer, CWC
14. Shri P. M. Scot, CE (PPO&PO&MI), CWC
15. Shri Sher Singh, Director, CWC
16. Shri R. P. S. Verma, Director, CWC

### Central Ground Water Board

17. Shri K. B. Biswas, Chairman, CGWB
18. Dr. Dipankar Saha, Member (SAM), CGWB
19. Shri G. C. Pati, Member (TT&WQ), CGWB

### National Water Mission

20. Shri Nikhilesh Jha, AS&MD, NWM

### National Mission for Clean Ganga

21. Dr. Rajat Bhargava, JS(CAD) &MD, NMCG

2. At the outset, the Chairperson welcomed the Members to the sitting of the Committee, convened to take evidence of the representatives of the Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR, RD & GR) - in connection with the examination of the subject "Indigenous and Modern forms of Water Conservation – Techniques and Practices". Thereafter, the Chairperson welcomed the representatives of the Ministry.

3. The Committee discussed in detail with the representatives of the Ministry, the national scenario of water resources, ground water position in the country, need for water conservation, different methods / measures of water conservation, artificial recharge of ground water and methods thereof, area specific techniques therefor, the budgetary provisions made for all these purposes, etc. Thereafter, the Ministry of Water Resources, River Development & Ganga Rejuvenation were allowed to make a power point presentation on various issues relating to the subject which *inter-alia* including water availability in the country, increasing demand of water for various purposes, traditional practices and modern techniques of water conservation, challenges facing this sector and the interventions required to address them along with the successful implementation of projects like Hiware Bazar of Maharashtra, Farmers Participatory Action Research Programmer of Tamil Nadu, Upleta taluka of Gujarat, etc. and best practices in ground water management in districts of Beed, Jalna & Satara in Maharashtra.

4. The Chairperson, however, expressed deep concern of the Committee over the challenges highlighted by the Secretary, Ministry of Water Resources, River Development & Ganga Rejuvenation and categorically desired to know about the steps taken / being taken by the Ministry to tackle these challenges, to create awareness among the masses about the conservation of water and its efficient use. Noting the mandate of the National Water Mission, the Committee also stressed the need for proper coordination among various Ministries, especially the Ministry of Water Resources, River Development & Ganga Rejuvenation and the Ministry of Environment, Forests & Climate Change, for the conservation of water and its proper utilisation for agriculture, drinking, sanitation and industry purposes. On being informed that under National Aquifer Mapping Programme, only an area of 5.5 lakh square kilometers has so far been mapped and 23 lakhs square kilometers remain to be mapped, for which a sum of 3000 crore of rupees is needed, the Committee emphasized the need for finishing the work related to Aquifer Mapping at the earliest as aquifer recharging is very important for increasing level of ground water. Responding to various queries from the Members of the Committee, the Secretary / representatives of the Ministry highlighted the significance of change in cropping patterns for minimal use of water and growing multiple crops in a given area. They also explained to the Committee in detail about the modern water conservation techniques viz. pressurized irrigation – sprinkler and drip methods, water harvesting through

rejuvenation of water bodies, construction of percolation tanks, check dams, farm ponds, preservation of natural forests, sacred Grooves, etc. They also elaborated other methods of water conservation techniques including Inter-linking of water bodies through canals; Mulching – application of organic or inorganic material to improve soil fertility; Use of Information and Communication Technology tools (ICT tools) for dissemination of information on Hydro meteorological data like water flow, water quality, etc.; Catchment Area Treatment, Efficient Water Uses Practices, Conjunctive Use of Surface and ground water, minimization of losses due to evaporation, Advanced Artificial Recharge Techniques sub-surface Dykes, Rain Water Harvesting through Recharge Shaft, etc. The issues related to traditional methods of farming and climate change impact on water resources, river basin models, over exploitation of the ground water and pollution were also discussed. The Committee noted that despite having all the knowledge and techniques on the conservation of water, ground water continues to fall, pollution is increasing and there is an acute shortage of drinking water and the Ministry have not been able to solve these problems in the past so many years. The Committee stated categorically that the time has come to show some demonstrable results. The Committee felt that further discussion is needed on these issues and accordingly asked the Ministry officials to come prepared with a definite roadmap for the purpose, if and when, called the next time.

5. The Committee, then, asked the Secretary, Ministry of Water Resources, River Development & Ganga Rejuvenation to furnish written replies to those queries raised by Members during the sitting - which could not be replied to by the representatives orally.

***The witnesses then withdrew.***

6. A copy of the verbatim proceedings of the sitting was kept for record.

The Committee then adjourned.

**MINUTES OF THE SIXTH SITTING OF THE STANDING COMMITTEE ON WATER RESOURCES (2016-17) HELD ON 14 MARCH, 2017**

The Committee sat from 1500 hours to 1515 hours in Committee Room 'C', Ground Floor, Parliament House Annexe, New Delhi.

**PRESENT**

Shri Hukum Singh – Chairperson

**MEMBERS**

**LOK SABHA**

2. Shri Radheshyam Biswas
3. Shri B. Vinod Kumar
4. Shri Abhijit Mukherjee
5. Shri Subhash Patel
6. Shri Vishnu Dayal Ram
7. Shri Ram Prasad Sarmah
8. Smt. V. Sathyabama
9. Shri Liladharbhai Vaghela

**RAJYA SABHA**

10. Sardar Balwinder Singh Bhunder
11. Dr. Bhushan Lal Jangde
12. Shri Ananda Bhaskar Rapolu
13. Shri A.V. Swamy
14. Shri Pradeep Tamta

**SECRETARIAT**

- |    |                    |   |                     |
|----|--------------------|---|---------------------|
| 1. | Shri Shiv Kumar    | - | Joint Secretary     |
| 2. | Smt. Rita Jaikhani | - | Director            |
| 3. | Shri Kushal Sarkar | - | Additional Director |



