सत्यमेव जयते

# जल क्षेत्र की एक झलक-2022

# WATER SECTOR AT A GLANCE-2022

**भारत सरकार**

GOVERNMENT OF INDIA

**परियोजना तैयारी संगठन**

PROJECT PREPARATION ORGANISATION

**केन्द्रीय जल आयोग**

CENTRAL WATER COMMISSION

**जल संसाधन, नदी विकास एवं गंगा संरक्षण विभाग**

DEPARTMENT OF WATER RESOURCES, RD & GR

**जल शक्ति मंत्रालय**

MINISTRY OF JAL SHAKTI

Reg. No.: CWC/2024/144

सत्यमेव जयते

# जल क्षेत्र की एक झलक-2022

# WATER SECTOR AT A GLANCE-2022


**जल सम्बंधित सांख्यिकी निदेशालय**/Water Related Statistics Directorate

**परियोजना तैयारी संगठन**/Project Preparation Organisation

**जल आयोजन एवं परियोजना स्कंध**/Water Planning & Projects Wing

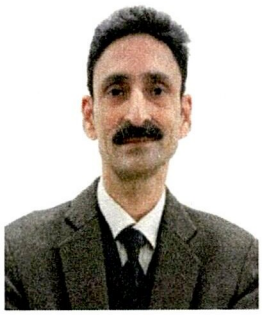
**केन्द्रीय जल आयोग**/Central Water Commission

(cwc.gov.in)



**अगस्त**, 2024 August, 2024

# FOREWORD



Central Water Commission (CWC) is India's premier technical organization in the field of water resources and functions as an attached office of the Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation, Government of India. The mandate of CWC is to promote integrated and sustainable development and management of India's water resources using state-of-the-art technology and expertise, in coordination with all stakeholders.

To meet the growing demand for data on water resources and related aspects, CWC publishes various reports at regular intervals. The current publication, 'Water Sector At A Glance-2022,' previously known as 'Abstract on Water Sector,' is the third edition of this annual report, providing a comprehensive overview of water resources and related aspects across India.

This edition includes updated data on the population and per capita average annual availability of water in India for 2025 and 2050, information on watersheds in India, capital expenditure, working expenses, and gross receipts for Major & Medium Irrigation Projects, Minor Irrigation Projects and the Command Area Development (CAD) Programme. Additionally, it features data on the sub-basin boundaries of India, basin-wise distribution of hydro-meteorological observation sites of CWC, information on Surface Minor Irrigation (SMI) scheme, highlights of the Namami Gange Programme, total gross irrigated area for crops, source-wise net irrigated area in India and details of cargo movement on the four national waterways of India for the years 2019-22.

Data is an indispensable part of governance, and the incorporation of updated water-related information in this publication will undoubtedly contribute to improve policymaking in the country. The entire team of WRS Directorate, PPO, under the leadership of Chief Engineer (PPO), CWC, has done an excellent job by putting in extra efforts to collect and compile extensive data from various Ministries, Departments, Organizations and Directorates of Central and State Governments to complete this publication on time. I also take this opportunity to commend all the data source agencies for providing the necessary data.

I hope this publication will be of great interest and use to users of water resource statistics and all concerned.

**New Delhi**
**August, 2024**

**(Kushvinder Vohra)**
**Chairman, CWC**

# ACKNOWLEDGEMENT

There are a number of water resources development projects which have been undertaken since independence in the country with the objective to ensure rational and balanced allocation of water. The planning, development, execution and management of these projects require a sound and broad database on water resources and related aspects. Central Water Commission being the lead nodal agency in the water resources sector with overall responsibility for its balanced development has been taking care of this aspect by documenting water and related data in the form of various publications. In this endeavor, 'Water Sector At A Glance-2022' is the publication intended to provide gist of water resources and related aspects at all India level.

The data/figures given in this publication is based on the information sourced from various Ministries/Departments/Organizations/Directorates of Central and State Governments. It has been attempted to incorporate latest available data of water resources sector in the publication as on March, 2022. Further, efforts have been made to make the publication concise by removing any duplicity and ambiguity in the publication and arranging data/material in structured form so as publication is useful for the stakeholders. Emphasis has been given in presenting data in graphical and tabular form wherever possible, for better understanding and quick analysis by user.

The work of collection, compilation and finalization of data for the publication was accomplished by the officers/officials of Water Related Statistics (WRS) Directorate of Project Preparation Organisation (PPO), WP&P Wing of CWC. The officers and staff of the Directorate have done a brilliant job in giving the publication a presentable shape under the guidance of Shri Pushkar Singh Kutiyal, former CE (PPO), CWC. The special contribution of Shri A K Kharya, CE (BPMO); Shri B P Pandey, CE (IMO); Shri Padma Dorje, CE (POMIO); Shri Rishi Shrivastava, CE (EMO) and Shri D P Mathuria, CE (P&D), for improvement of this publication, is highly appreciated.

I appreciate the efforts put in by all the data source agencies which contributed the data/information and supported our efforts to bring out this publication.

Suggestions/comments, if any, for further improvement of the publication will be highly appreciated.

**New Delhi**

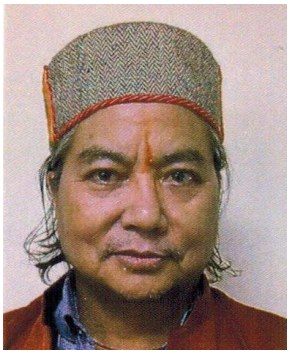
**August, 2024**

नवीन कुमार

**(Navin Kumar)**

**Member (WP&P), CWC**

# PREFACE



**W**ater resource challenges faced by India are considerable and can only be addressed by adopting an integrated approach that considers all uses and sources of water (surface water, ground water, etc) from the river basin/hydrological perspective. This requires sound information and knowledge on the water resource base and its uses, coupled with the availability of appropriate tools for collection, compilation, analysis and decision making. Hydro-meteorological observations and statistical analysis thereon are the basis for efficient and sustainable water management.

Central Water Commission is the nodal agency in the water resources sector. It is mandated to promote integrated and sustainable development and management of India's water resources by using state-of-the-art technology and competency. To cater to the ever-growing needs of data on water resources and related aspects, WRS Dte., PPO (previously under ISO) brings out various publications at regular intervals.

'Water Sector at A Glance-2022' erstwhile 'Abstract on Water Sector', is the third edition of this annual publication for providing gist of water resources and related aspects at all India level. The statistics included in the publication inter-alia provide the information on National Water Policy, 2012 and its salient features. Attempts have been made to present water statistics both in tabular as-well-as in map/graphical formats for better and quick understanding by the stakeholders.

I would like to express my deep gratitude to Shri Kushvinder Vohra, Chairman, CWC and Shri Navin Kumar, Member (WP&P), CWC for their continuous support, guidance and encouragement to bring out this publication in the form. My gratitude is also due to the fellow organizational heads, Chief Engineers of CWC (HQ), who have through their suggestions during the meeting by the Member (WP&P), followed by valuable inputs paved improvement in the publication.

The publication has been prepared through the combined efforts of the officers and officials of the WRS Dte., Project Preparation Organisation (PPO). The efforts made by Ms. Suchitra Yadav, Joint Director; Mr. Sanjeev Sharan Pandey, Deputy Director; Ms. Lalita Bisht, Senior Statistical Officer and Ms. Sarita, Junior Statistical Officer; are commendable.

I hope, the publication will prove to be a useful document to policymakers, planners, academicians and researchers. It shall be an endeavour on part of PPO, CWC to continuously improve the publication both in content and design with the help of users feedback.

**(Pushkar Singh Kutiyal)**

**Former Chief Engineer (PPO), CWC**

## TEAM OF OFFICERS ASSOCIATED WITH THE PUBLICATION (WRS DTE., PPO)

**In supervision of**

| | |
|---|---|
| Mr. Pushkar Singh Kutiyal | Former Chief Engineer |

**Editorial Board**

| | |
|---|---|
| Ms. Suchitra Yadav | Joint Director |
| Mr. Sanjeev Sharan Pandey | Deputy Director |
| Ms. Lalita Bisht | Senior Statistical Officer |
| Ms. Sarita | Junior Statistical Officer |

*******

**Acronyms and Abbreviations**

| | |
|---|---|
| AIBP | Accelerated Irrigation Benefits Programme |
| BCM | Billion Cubic Metre |
| BCM/yr | Billion Cubic Metre per year |
| BP | Basin Planning |
| BPMO | Basin Planning & Management Organization |
| CA | Central Assistance |
| CAD | Command Area Development |
| CAD&WM | Command Area Development & Water Management |
| CCA | Culturalable Command Area |
| CCEA | Cabinet Committee on Economic Affairs |
| CEA | Central Electricity Authority |
| CGWB | Central Ground Water Board |
| CIWTC | Central Inland Water Transport Corporation |
| CLA | Central Loan Assistance |
| cm | Centimetre |
| Cr | Crore |
| CUI | Coverage Under Irrigation |
| cum | Cubic Metre |
| cumec | Cubic Metre per Second |
| cusec | Cubic Feet per Second |
| CWC | Central Water Commission |
| CWPRS | Central Water and Power Research Station |
| DDP | Desert Development Programme |
| DHARMA | Dam Health and Rehabilitation Monitoring Application |
| DPAP | Drought Prone Areas Programme |
| DRIP | Dam Rehabilitation and Improvement Project |
| EFC | Expenditure Finance Committee |
| EMO | Environment Management Organisation |
| ERM | Extension, Renovation and Modernization |
| FBP | Farakka Barrage Project |
| FMP | Flood Management Programme |
| FRL | Full Reservoir Level |
| GD | Gauge and Discharge Site |

**Contd...**

**Acronyms and Abbreviations**

| | |
|---|---|
| GDP | Gross Domestic Product |
| GDQ | Gauge, Discharge and Water Quality Site |
| GDS | Gauge, Discharge and Sediment Site |
| GDSQ | Gauge, Discharge, Sediment and Water Quality Site |
| GFCC | Ganga Flood Control Commission |
| GIA | Gross Irrigated Area |
| GQ | Gauge and Water Quality Site |
| GSA | Gross Sown Area |
| GVA | Gross Value Added |
| GW | Giga Watt/ Ground Water |
| GWS | Ground Water Scheme |
| Ha | Hectare |
| HDD | Hydrological Data Directorate |
| HEPR | Hydro Electric Potential Reassessment Division |
| HFL | Highest Flood Level |
| HKKP | Har Khet Ko Pani |
| HP | Horse Power |
| HQ | Head Quarter |
| IPC | Irrigation Potential Created |
| IPU | Irrigation Potential Utilised |
| ISO | Information System Organisation |
| IWAI | Inland Waterways Authority of India |
| IWDP | Integrated Watershed Development Project |
| IWRM | Integrated Water Resources Management |
| IWT | Inland Water Transport |
| km | Kilometer |
| $km^2$ | Square Kilometer |
| $km^3$ | Cubic Kilometer |
| KW | Kilo Watt |
| KW/h | Kilo Watt per hour |
| LTIF | Long Term Irrigation Fund |
| MCM | Million Cubic Metre |

**Contd...**

**Acronyms and Abbreviations**

| | |
|---|---|
| MCM/yr | Million Cubic Metre per year |
| Mha | Million Hectare |
| MLD | Million Litres per Day |
| mm | Millimetre |
| MMI | Major and Medium Irrigation |
| MW | Mega Watt |
| NABARD | National Bank for Agriculture and Rural Development |
| NAPCC | National Action Plan on Climate Change |
| NCIWRD | National Commission on Integrated Water Resources Development |
| NIA | Net Irrigated Area |
| NIH | National Institute of Hydrology |
| NIT | National Institute of Technology |
| NP | National Project |
| NRDWP | National Rural Drinking Water Programme |
| NRMD | Natural Resource Management Directorate |
| NRSC | National Remote Sensing Centre |
| NSA | Net Sown Area |
| NWP | National Water Policy |
| NWRC | National Water Resources Council |
| PDA | Pancheshwar Development Authority |
| PIM | Participatory Irrigation Management |
| PL | Price Level |
| PMKSY | Pradhan Mantri Krishi Sinchayee Yojana |
| PMO | Project Monitoring Organisation |
| RDC | River Data Compilation |
| RGI | Registrar General of India |
| RRR | Repair, Renovation and Restoration |
| SG&Met | Snow Gauge & Meteorological Site |
| Sq.km | Square Kilometer |
| STP | Sewage Treatment Plant |
| SW | Surface Water |
| TCA | Total Cultivable Area |

**Contd...**

**Acronyms and Abbreviations**

| | |
|---|---|
| Th. Ha | Thousand Hectare |
| Ton/Ha | Ton per Hectare |
| UID | Unique Identifier |
| UIP | Ultimate Irrigation Potential |
| UT | Union Territory |
| WM | Water Management |
| WP&P | Water Planning and Projects Wing |
| WQSS | Water Quality Sampling Station |
| WRIS | Water Resources Information System |
| WRS | Water and Related Statistics |
| WUA | Water Users' Association |

*******

## CONTENTS



**Contd…**

## CONTENTS



**Contd…**

## CONTENTS



**Contd…**

## CONTENTS

# Executive Summary

Water is an indispensable element in every sector of the economy, be it primary, secondary or tertiary sectors. These water demands are fulfilled by various sources of water supply-surface water bodies like river, lakes and ponds; ground water and others. But these resources are under severe environmental stress due to the growing population and increased levels of developmental activities, industrialization and urbanization etc.

Water has cross sectoral linkages over various sectors such as food, energy, agriculture, industries and urban development and others, thus, cannot be considered in isolation, which makes it challenging for the policy makers for apportioning diminishing supplies between ever increasing demands. Factors such as demography and climate change further increase the stress on water resources and need for highlighting the water security. In many regions, the availability of water in both quantity and quality is being severely affected by climate change, with more or less precipitation in different regions and more extreme weather events. Thus, water resource management plays an important role.

The Water Related Statistics (WRS) Directorate, PPO, CWC brings out various publications at regular intervals on statistics related to water resources development & management and related aspects. The present publication provides gist of water resources and related aspects at all India level. An attempt has been made to cover a wide range of data on water and related resources in the country. The information given in the publication is collected from various Directorates of CWC, various Ministries/Departments and other organizations.

It comprises 8 Sections. The water statistics are present both in tabular as-well-as in map/graphical formats for better and quick understanding by the stakeholders.
The structure of this publication is as follows:

- Section-I : 'National Water Policy, 2012'
- Section-II : 'Water Resources at a Glance'
- Section-III : 'Major & Medium Irrigation and other Projects'
- Section-IV : 'Flood Management'
- Section-V : 'Land-Use Statistics'
- Section-VI : 'Navigation-Inland Water and Transport'
- Section-VII : 'Hydro-Electric Potential'
- Section-VIII: 'International Treaties and Cooperation'

Section-I on 'National Water Policy, 2012' gives the information on the formation of National Water Policies-1987, 2002 and 2012. It gives the details of the States which are having State Water Policies in pursuance of National water policy 1987, 2002 and 2012. It also provides the salient features of the National Water Policy, 2012.

Section-II on 'Water Resources at a Glance' presents a brief global water scenario, world land resources and a summary on India-land and water resources. It also provides per capita water availability in India and details on the total renewable internal fresh water resources per capita of Top 10 and Bottom 10 countries. It deals with water resources potential in River Basins of India including catchment area of the River basins, inland water resources and other water bodies, Watersheds in India, annual and monthly rainfall in India, status of monitored glacial lakes and water bodies and Hydrological Network of CWC. It also provides information on designated best uses of water and water quality standards in India. It also gives the details on the water quality monitoring activities of CWC. It also provides information on the Dam Safety Act, 2021 and important provisions of it, Dam Rehabilitation and Improvement Project (DRIP), Abstract of large dams and State/Basin-wise Live Storage Capacity of Reservoirs. This Section also displays State/UT-wise Categorization of Assessment Units in India, 2022, State/UT-wise Ground Water Monitoring Wells in India and State-wise Ground Water Resources in India, 2022. In this Section, 7 Maps are provided covering the information on River Basins of India, Sub-Basin Boundary of India, DRIP Phase II & Phase III Coverage across India, Categorization of Assessment Units as per Dynamic Ground Water Resources Assessment of India-2022, Principal Aquifer System of India, Ground Water Monitoring Stations in India and Water Level Scenario in India.

Section-III on 'Major & Medium Irrigation and other Projects' deals with the financial aspects of water and related sectors in the country such as details on Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and its major components -Accelerated Irrigation Benefits Programme (AIBP) and Har Khet Ko Pani (HKKP). It also gives the details on the sub-components-National Projects, Command Area Development & Water Management (CAD&WM) Programme, Surface Minor Irrigation Scheme, Repair, Renovation & Restoration (RRR) of Water Bodies Scheme and PMKSY-HKKP, Ground Water Scheme. It provides the details on special package for Maharashtra/Sirhind Feeder (SF) and Rajasthan Feeder (RF). This Section also consists of the data/information on External Assistance for development of water resources, National Water Mission & Climate Change Issue and Namami Gange Programme. It also provides the data/information on Minor irrigation census and details on the Plan-wise Financial Expenditure on Minor Irrigation-Institutional. It also provides the details on the Capital Expenditure, Working Expenses and Gross Receipts for Major & Medium irrigation projects, Minor irrigation projects and CAD programme at all India level.

Section-IV on 'Flood Management' deals with State-wise and Basin-wise Flood Forecasting Stations, Flood Forecasting Performance, Flood Damage, Flood Management Programme (FMP), Flood Management and Border Areas Programme (FMBAP), River Management Activities & works related to Border Areas (RMBA) Component and distribution of Revenue & Capital Expenditure incurred by sub-major head of accounts.

Section-V on 'Land-Use Statistics' deals with the data on selected Land-use & Irrigation Statistics, Irrigation area under principal crops, sources of irrigation along with area irrigated and productivity of food grains. It provides information on State/UT-wise Water Rates for Flow and Lift Irrigation.

Section-VI on ‘Navigation-Inland Water and Transport’ provides the criteria for declaration of National Waterway, details of National Waterways (1-5) and development of 106 new National Waterways. It also provides the details of cargo movement on major waterways in the country.

Section-VII on ‘Hydro-Electric Potential’ provides the data/information on electricity generation & consumption. Hydro-Electric Potential forms an integral part of overall development of water resources of the river basin. The hydro schemes also form part of the complex integrated power generation system with diverse power generation resources. It also provides Region/State-wise and Basin-wise status of Large Hydro Electric Potential Development (in terms of installed capacity - above 25 MW).

Section-VIII on ‘International Treaties and Cooperation’ consists of the list of 13 Nos. of Memorandum of Understanding (MoU) and 2 Nos. of Memorandum of Cooperation (MoC) between India & other countries and brief note on the International Treaties and Transboundary Cooperation of India with five neighbouring countries on trans-boundary rivers in the field of Water Resources Management. Cooperation with other countries in water sector help water experts to set new standards for water resources management by sharing best practices, knowledge, latest technology and breakthroughs in theoretical and applied science and so on.

*******

# Section-I
# National Water Policy, 2012

i. Water, which is a vital sustenance for life and economic development, is becoming an increasingly scarce resource in the country. The planning and execution of water resources development have by and large been carried out by the individual State. As the major rivers in our country are inter-State in nature, it has not been possible for individual State to prepare master plans in respect of these rivers. It was felt that planning at the national level for utilization of water resources should be undertaken so that the greatest goal is achieved and optimum benefits derived from the available water resources.

ii. This Section gives the information on the formation of National Water Policies-1987, 2002 and 2012. It gives the details of the States which are having State Water Policies in pursuance of National water policy 1987, 2002 and 2012. It also provides the salient features of the National Water Policy, 2012.

## 1.1 Formulation of National Water Policy (NWP)

i. The NWP is adopted by the National Water Resource Council (NWRC), which was established in March, 1983. The Prime Minister of India is the Chairman of the NWRC and the Minister of Water Resources is the Vice-Chairman. Members comprise Minister of State for Water Resources; the Union Ministers or Ministers of State from a few related Central ministries; Chief Ministers of all the states; and Lieutenant Governors/Administrators of all the Union Territories. Secretary, Ministry of Water Resources (M/o Water Resources) is the Secretary of the NWRC.

ii. There is also a National Water Board (NWB), which is chaired by the Secretary, M/o Water Resources. Its members include Secretaries of the Union Ministries of Agriculture, Rural Development, Urban Development, Surface Transport, Environment and Forests, Planning, and Science and Technology; Chairman, Central Water Commission (CWC); and Chief Secretaries of all the States and Union Territories. Its Member Secretary is the Member for Water Planning and Projects of the CWC. The NWB reports to the NWRC. The process followed is that the draft NWP is first examined by the Board. Changes are made based on the inputs received from the Board members. The draft is then finalized by the Board and then sent to the Council for its assessment and review. The Council then finally approves the NWP.

iii. The first National Water Policy (NWP) was adopted by the NWRC during its 2$^{nd}$ meeting held on 9$^{th}$ September, 1987. This policy guided the formulation of policies and programmes for water resources development and its management. Thereafter, new challenges emerged in the water resources sector, which necessitated review of the National Water Policy. Accordingly, the revised National Water Policy, 2002 was adopted by the NWRC in its 5$^{th}$ meeting held on 1$^{st}$ April, 2002.

### 1.2 National Water Policy, 2012

1) India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change. While engaged with the international community to collectively and cooperatively deal with this threat, India needed a national strategy to firstly, adapt to climate change and secondly, to further enhance the ecological sustainability of India's development path.

2) With a view to address the related issues, the National Action Plan on Climate Change (NAPCC) was prepared by the Government of India and released by the Hon'ble Prime Minister in 2008. The NAPCC had laid down the principles and had identified the approach to be adopted to meet the challenges of impact of climate change through eight National Missions one of which was National Water Mission.

3) This Comprehensive Mission Document of 'National Water Mission' identifies the strategies for achieving the goals of (a) Comprehensive water data base in public domain and assessment of the impact of climate change on water resource, (b) Promotion of citizen and state actions for water conservation, augmentation and preservation, (c) Focused attention to vulnerable areas including over-exploited areas, (d) Increasing water use efficiency by 20%, and (e) Promotion of basin level integrated water resources management.

4) Under Goal 5 of the National Water Mission i.e. 'Promotion of basin level integrated water resources management', Review of National Water Policy was one of the identified strategies. In pursuance to the strategy identified in National Water Mission Document as well as deliberations in National Water Board, Ministry of Water Resources initiated the process of review of National Water Policy, 2002.

5) A series of consultation meetings were held with Hon'ble Members of Parliamentary Standing Committee on Water Resources, Academia, Experts and Professionals, Non-Governmental Organizations and representatives of Panchayati Raj Institutions. A drafting committee was also constituted on 5$^{th}$ April, 2011 under the chairmanship of Dr. S. R. Hashim, former Member Planning Commission and Chairman UPSC for drafting the National Water Policy. Considering the recommendations and feedback received during various consultation meetings, the Drafting Committee identified basic concerns in water resources sector and adopted basic principles which should be followed to address those concerns, and accordingly, evolved draft policy recommendations. The draft National Water Policy, 2012, recommended by the Drafting Committee was circulated in public domain as well as amongst all State Governments and related Union Ministries for comments. Accordingly, after incorporating the comments received, the Drafting Committee recommended Revised Draft National Water Policy, 2012.

6) The National Water Board under the Chairmanship of Secretary (WR) considered the Revised Draft National Water Policy, 2012 at its 14$^{th}$ meeting held on 7$^{th}$ June, 2012. The Draft National Water Policy arrived at as per deliberations of the National Water

Board meeting was again circulated amongst all States/UTs and related Central Ministries. The draft policy was also discussed with the Consultative Committee of Parliament attached to the Ministry of Water Resources. The Draft National Water Policy (2012) was deliberated by the National Water Resources Council (NWRC) at its 6th meeting on 28th December, 2012 under the Chairmanship of Hon'ble Prime Minister of India, wherein the National Water Policy, 2012 was adopted as per deliberations. Subsequent to approval of the National Water Policy, 2012, it was forwarded to all the State Governments/UTs and the concerned Ministries/Departments of the Central Government for appropriate action.

7) As per the National Water Policy, State Water Policies were to be drafted/revised in accordance with this policy keeping in mind the basic concerns and principles as also a unified national perspective. As per available information, 16 States have adopted their State Water Policies in pursuance to National Water Policy 1987, National Water Policy 2002 and National Water Policy 2012.

8) State Water Policies in pursuance of National Water Policy 1987 and 2002 are:

i. Andhra Pradesh (2008)
ii. Chhattisgarh (2001)
iii. Jharkhand (2011)
iv. Karnataka (2002)
v. Kerala (2008)
vi. Madhya Pradesh (2003)
vii. Odisha (2007)
viii. Rajasthan (2010)
ix. Sikkim (2009)
x. Tamil Nadu (1994)
xi. Uttar Pradesh (1999)

9) State Water Policies in pursuance of National Water Policy, 2012 are:

i. Himachal Pradesh (2013)
ii. Maharashtra (2019)
iii. Meghalaya (2019)
iv. Puducherry (2016)
v. Goa (2021)
vi. Karnataka (2022)

10) Further, for revision of the National Water Policy, 2012, Ministry of Jal Shakti constituted a Committee on 05.11.2019 under the chairmanship of Dr. Mihir Shah, to draft the National Water Policy. The final draft of National Water Policy dated 07.11.2020 has been submitted by the Drafting Committee to the Ministry of Jal Shakti.

### 1.3 Salient Features of National Water Policy, 2012

i. Emphasis on the need for a national water framework law, comprehensive legislation for optimum development of inter-State rivers and river valleys.

ii. Water, after meeting the pre-emptive needs for safe drinking water and sanitation, achieving food security, supporting poor people dependent on agriculture for their livelihood and high priority allocation for minimum eco-system needs, be treated as economic good so as to promote its conservation and efficient use.

iii. Ecological needs of the river should be determined recognizing that river flows are characterized by low or no flows, small floods (freshets), large floods and flow variability and should accommodate development needs. A portion of river flows should be kept aside to meet ecological needs ensuring that the proportional low and high flow releases correspond in time closely to the natural flow regime.

iv. Adaptation strategies in view of climate change for designing and management of water resources structures and review of acceptability criteria has been emphasized.

v. A system to evolve benchmarks for water uses for different purposes, i.e., water footprints and water auditing be developed to ensure efficient use of water. Project financing has been suggested as a tool to incentivize efficient & economic use of water.

vi. Setting up of Water Regulatory Authority has been recommended. Incentivization of recycle and re-use has been recommended.

vii. Water Users Associations should be given statutory powers to collect and retain a portion of water charges, manage the volumetric quantum of water allotted to them and maintain the distribution system in their jurisdiction.

viii. Removal of large disparity in stipulations for water supply in urban areas and in rural areas has been recommended.

ix. Water resources projects and services should be managed with community participation. Wherever the State Governments or local governing bodies so decide, the private sector can be encouraged to become a service provider in public private partnership model to meet agreed terms of service delivery, including penalties for failure.

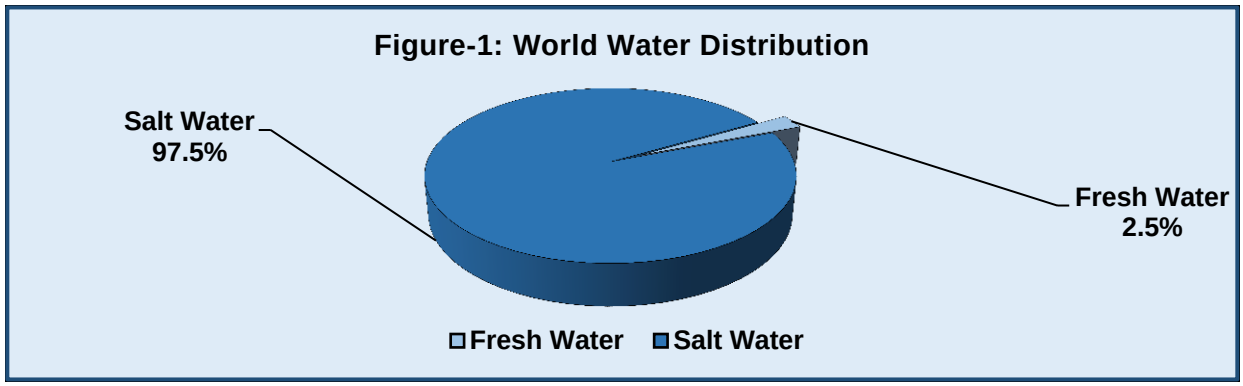
x. Adequate grants to the States to update technology, design practices, planning and management practices, preparation of annual water balances and accounts for the site and basin, preparation of hydrologic balances for water systems, and benchmarking and performance evaluation.

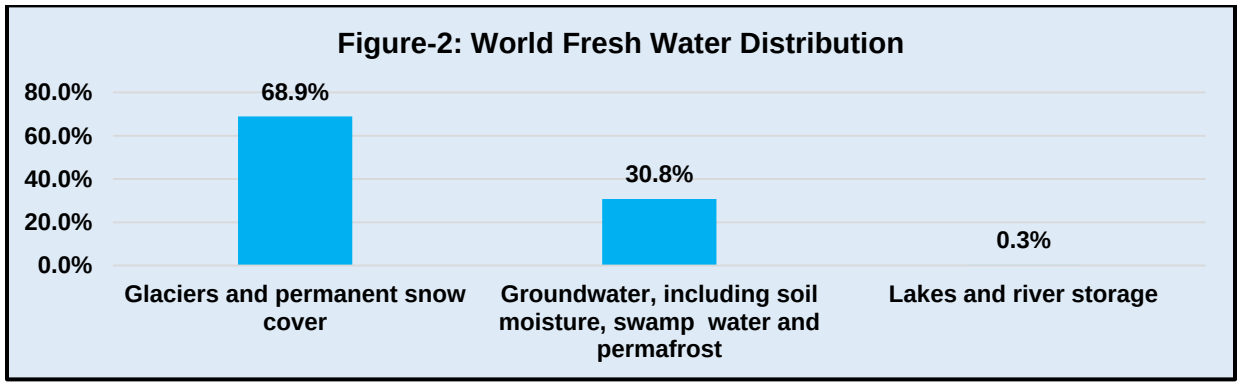
*******

# Section-II
# Water Resources at a Glance

i. This Section first presents global water scenario and a summary on India-land and water resources. It also provides per capita water availability in India and details on the total renewable internal fresh water resources of countries. It deals with water resources potential in River Basins of India, inland water resources and other water bodies, watersheds in India, annual and monthly rainfall in India, status of monitored glacial lakes and water bodies and hydrological Network of CWC. It also provides information on designated best uses of water and water quality standards in India. It also gives the details on the water quality monitoring activities of CWC. It also provides information on the Dam Safety Act, 2021 and its important provisions, Dam Rehabilitation and Improvement Project, Abstract of large dams and State/Basin-wise Live Storage Capacity of Reservoirs. This Section also displays State/UT-wise categorization of assessment units in India, State/UT-wise Ground Water Monitoring Wells in India and State-wise Ground Water Resources in India.

ii. Water resources are natural resources of water that are potentially useful. Uses of water include agricultural, industrial, household, recreational and environmental activities. All living things require water to grow and reproduce. About 97.5% of the water on the Earth is salt water and only about 2.5% is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water is found mainly as ground water, with only a small fraction present above ground or in the air. The distribution of world water resources is given in the figures below:




Source: Vital Water Graphics, UNEP
https://www.unep.org/resources/report/vital-water-graphics-overview-state-worlds-fresh-and-marine-waters,

**Table 2.1: India- Land and Water Resources**

| | |
|---|---|
| **A. General** | |
| Total Geographical Area (TGA) (2021-22) | 328.75 Mha |
| Area as % of World Area | 2.44% |
| Location | Latitude 8°4'N to 37°6'N Longitude 68°7'E to 97°25' E |
| Forest Cover (2021) | 21.71 % of TGA |
| Population (as Per Census of India 2011) | 1210.57 Million |
| Annual Rainfall (2021) | 1236.4 mm |
| **B. Water Resources** | |
| Average Annual Precipitation | 3880 BCM |
| Average Annual Water Resources (as per Reassessment of Water Availability in India using Space Inputs-2019) | 1999.2 BCM |
| Estimated Utilizable Surface Water Resources | 690.1 BCM |
| Total Annual Ground Water Recharge (as per Ground Water Reassessment-2022) | 437.6 BCM |
| Total Annual Utilizable Water Resources | 1127.7 BCM |
| Per Capita Water Availability (2011 Census) | 1545 $m^3$/year |
| Large Dams | 5745 Nos. |
| Completed Dams | 5334 Nos. |
| Under Construction | 411 Nos. |
| Storage Capacity | 257.812 BCM |
| **C. Land Resources** | |
| Total Cultivable Land (2021-22) | 154.26 Mha |
| Gross Area Sown (2021-22) | 219.16 Mha |
| Net Area Sown (2021-22) | 141.01 Mha |
| Gross Irrigated Area (2021-22) | 120.38 Mha |
| Net Irrigated Area (2021-22) | 77.92 Mha |
| **D. Hydropower** (Capacity as on 31.03.2022) | |
| Identified Hydroelectric Potential (Total) | 148701 MW |
| Identified Hydroelectric Potential (above 25 MW) as per Re-assessment Study | 145320 MW |
| Capacity under Operation (above 25 MW) | 41778.90 MW |
| Capacity Under Construction (above 25 MW) | 9927.50 MW |

Source: BP-1 & DSM Directorates, CWC; CGWB; RGI; 'India State of Forest Report 2021', Forest Survey of India; M/o Environment, Forest & Climate Change; IMD; Central Electricity Authority; 'Land Use Statistics at a Glance 2011-12 to 2021-2022', Economics Statistics & Evaluation Division, D/o Agriculture & Farmers Welfare, M/o Agriculture & Farmers Welfare

## 2.1 Per Capita Water Availability in India

i. Water availability per person is dependent on population of the country and for India, per capita water availability in the country is reducing due to increase in population. India is now facing a water stressed situation as the per capita water availability in India is below 1700 cubic metres. The country has been facing a water crisis both for agriculture as well as for basic needs. The average annual per capita water availability in the years 2001 and 2011 was assessed as 1816 cubic metres and 1545 cubic metres respectively which may further reduce with increase in reverse proportion of population growth in the year 2031.

ii. Water demand is predicted to increase significantly over the coming decades. In addition to the agricultural sector, which is responsible for 70% of water abstractions nationwide, large increases in water demand are predicted for industry and energy production. Accelerated urbanization and the expansion of municipal water supply and sanitation systems also contribute to the rising localised demand. Climate change scenarios project an exacerbation of the spatial and temporal variations of water cycle dynamics, such that discrepancies between water supply and demand are becoming increasingly aggravated.

iii. The per Capita Water Availability for India assessed during different years based on Reassessment Reports are given below:

| Year | Population (In Millions) | Per capita Average Annual Availability ($m^3$/year) | Note |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 2001 | 1029 (2001 census) | 1816 | Based on the study of "Reassessment of Water Resources Potential of India", CWC, 1993 with Average Water Resources Potential as 1869 BCM |
| 2011 | 1210 (2011 census) | 1545 | |
| 2021 | 1345 | 1486 | Based on the study of "Reassessment of Water Availability in India using Space Inputs", CWC, 2019 with Average Annual Water Resources Potential as 1999.2 BCM<br><br>Population figures for 2021 to 2051 are taken from projected population by Planning Commission available at http://planningcommission.nic.in/aboutus/committee/strgrp/stgp_fmlywel/sgfw_ch2.pdf |
| 2031 | 1463 | 1367 | |
| 2041 | 1560 | 1282 | |
| 2051 | 1628 | 1228 | |

Source: BPMO, CWC, M/o Jal Shakti

**Map 1: River Basin Map of India**


Source: NWIC, D/o Water Resources, RD &GR, M/o Jal Shakti.

**Table 2.2: Per Capita Average Annual Availability of Water in India during 2025 & 2050**

| Sl. No. | River Basin | Average Annual Water Resources Potential (BCM)$ | Estimated Population (Million)# | | Estimated per Capita Average Water Availability (cum) | |
|---|---|---|---|---|---|---|
| | | | 2025 | 2050 | 2025 | 2050 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Indus (up to Border) | 45.53 | 69.2 | 81.41 | 657.95 | 559.27 |
| 2 | Ganga-Brahmaputra-Meghna | | | | | |
| | a) Ganga | 509.52 | 593.04 | 697.69 | 859.17 | 730.30 |
| | b) Brahmaputra | 527.28 | 48.06 | 56.54 | 10971.29 | 9325.79 |
| | c) Barak & others | 86.67 | 10.24 | 12.05 | 8463.87 | 7192.53 |
| 3 | Godavari | 117.74 | 89.18 | 104.92 | 1320.25 | 1122.19 |
| 4 | Krishna | 89.04 | 100.41 | 118.13 | 886.76 | 753.75 |
| 5 | Cauvery | 27.67 | 48.39 | 56.93 | 571.81 | 486.04 |
| 6 | Subernarekha | 15.05 | 15.52 | 18.26 | 969.72 | 824.21 |
| 7 | Brahamani & Baitarni | 35.65 | 16.18 | 19.04 | 2203.34 | 1872.37 |
| 8 | Mahanadi | 73 | 43.93 | 51.68 | 1661.73 | 1412.54 |
| 9 | Pennar | 11.02 | 16.02 | 18.85 | 687.89 | 584.62 |
| 10 | Mahi | 14.96 | 17.34 | 20.4 | 862.75 | 733.33 |
| 11 | Sabarmati | 12.96 | 17.34 | 20.4 | 747.40 | 635.29 |
| 12 | Narmada | 58.21 | 24.28 | 28.56 | 2397.45 | 2038.17 |
| 13 | Tapi | 26.24 | 24.44 | 28.75 | 1073.65 | 912.70 |
| 14 | West Flowing Rivers from Tapi to Tadri | 118.35 | 42.61 | 50.13 | 2777.52 | 2360.86 |
| 15 | West Flowing Rivers from Tadri to Kanyakumari | 119.06 | 53.84 | 63.34 | 2211.37 | 1879.70 |
| 16 | East Flowing Rivers between Mahanadi &Pennar | 26.41 | 38.97 | 45.85 | 677.70 | 576.01 |
| 17 | East Flowing Rivers between Pennar and Kanyakumari | 26.74 | 74.32 | 87.43 | 359.80 | 305.84 |
| 18 | West Flowing Rivers of Kutch and Saurashtra including Luni | 26.93 | 36.5 | 42.94 | 737.81 | 627.15 |
| 19 | Area of Inland drainage in Rajasthan | | 11.73 | 13.79 | - | - |
| 20 | Minor River draining into Myanmar (Burma) & Bangladesh | 31.17 | 2.48 | 2.91 | 12568.55 | 10711.34 |
| **Total** | | **1999.2** | **1394.02** | **1640** | **1434.13** | **1219.02** |

Source: B.P. Directorate, CWC, M/o Jal Shakti

Note: '$': Reassessment of Water Availability in India using Space Inputs, 2019, CWC.

'#': Report of the Standing Sub-Committee for assessment of availability and requirement of water for diverse uses in the country, August, 2000.

## 2.2 Water Requirement

i. The requirement of fresh water both for irrigation and other uses is growing continuously. The requirement of water for various sectors has been assessed by the National Commission on Integrated Water Resources Development (NCIWRD) in the year 2000. This requirement is based on the assumption that irrigation efficiency will increase to 60% from the current level of 35-40%.

ii. Projected Water Demand in India (By Different Use) is given below:

| Sector | Water Demand in $km^3$ or BCM | | | | | |
|---|---|---|---|---|---|---|
| | Standing Sub-Committee of M/o Jal Shakti, D/o Water Resources, RD & GR | | NCIWRD | | | |
| | | | 2025 | | 2050 | |
| | 2025 | 2050 | Low | High | Low | High |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Irrigation | 910 | 1072 | 561 | 611 | 628 | 807 |
| Drinking Water | 73 | 102 | 55 | 62 | 90 | 111 |
| Industry | 23 | 63 | 67 | 67 | 81 | 81 |
| Energy | 15 | 130 | 31 | 33 | 63 | 70 |
| Other | 72 | 80 | 70 | 70 | 111 | 111 |
| **Total** | **1093** | **1447** | **784** | **843** | **973** | **1180** |

Source: Basin Planning Directorate, CWC, XI Plan Document.
Report of the Standing Sub-Committee on 'Assessment of Availability & Requirement of Water for Diverse uses in the Country-2000'

**Figure-3: Estimated Sector-wise High Demand in India during 2050 (As per NCIWRD)**

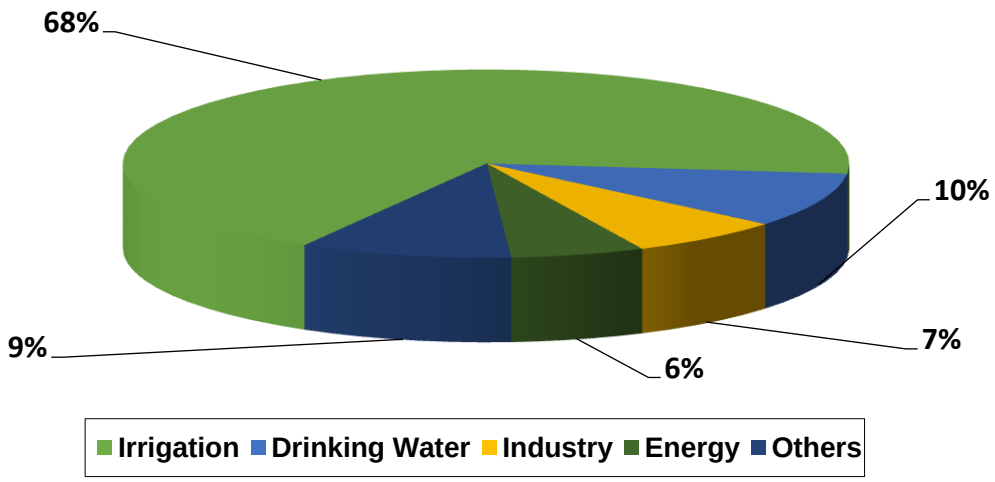
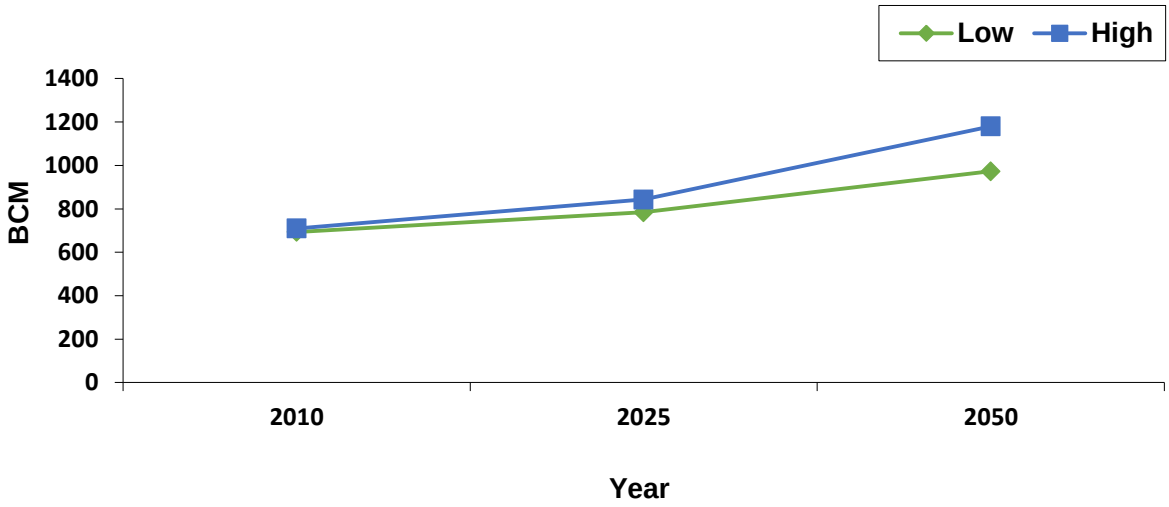


**Figure-4: Projected Water Demand in India (As per NCIWRD)**




iii. The Standing Committee of M/o Jal Shakti also assesses it periodically. The total water demand for all the uses is likely to be 1,180 BCM by 2050 as per NCIWRD. Though major share of this would be consumed for irrigation purposes, this in no way undermines importance of providing portable drinking water. Infact, it may be presumed that drinking water provision would have to be given an added thrust since the lack of such facility is likely to entail serious social, economic and health impact.

**Table 2.3: Water Resources Potential in River Basins of India**

| Sl. No. | River Basin | Catchment Area (Sq.km) | Average Water Resources Potential (BCM) | Utilisable Surface Water Resources (BCM) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | Indus (up to Border) | 3,17,708 | 45.53* | 46 |
| 2 | a) Ganga | 8,38,803 | 509.52 | 250 |
| | b) Brahmaputra | 1,93,252 | 527.28 | 24 |
| | c) Barak & Others | 86,335 | 86.67 | - |
| 3 | Godavari | 3,12,150 | 117.74 | 76.3 |
| 4 | Krishna | 2,59,439 | 89.04 | 58 |
| 5 | Cauvery | 85,167 | 27.67 | 19 |
| 6 | Subernarekha | 26,804 | 15.05 | 6.8 |
| 7 | Brahamani & Baitarni | 53,902 | 35.65 | 18.3 |
| 8 | Mahanadi | 1,44,905 | 73 | 50 |
| 9 | Pennar | 54,905 | 11.02 | 6.9 |
| 10 | Mahi | 39,566 | 14.96 | 3.1 |
| 11 | Sabarmati | 31,901 | 12.96 | 1.9 |
| 12 | Narmada | 96,659.79 | 58.21 | 34.5 |
| 13 | Tapi | 65,805.80 | 26.24 | 14.5 |
| 14 | West Flowing Rivers from Tapi to Tadri | 58,360 | 118.35 | 11.9 |
| 15 | West Flowing Rivers from Tadri to Kanyakumari | 54,231 | 119.06 | 24.3 |
| 16 | East Flowing Rivers between Mahanadi & Pennar | 82,073 | 26.41 | 13.1 |
| 17 | East Flowing Rivers between Pennar and Kanyakumari | 1,01,657 | 26.74 | 16.5 |
| 18 | West Flowing Rivers of Kutch and Saurashtra including Luni | 1,92,112 | 26.93 | 15 |
| 19 | Area of Inland drainage in Rajasthan | 1,44,835.90 | ----- | N.A |
| 20 | Minor River draining into Myanmar (Burma) & Bangladesh | 31,382 | 31.17 | N.A |
| **Total** | | **32,71,953**** | **1999.2** | **690.1** |

Source: Reassessment of Water Availability in India using Space Inputs-2019, BPMO, Central Water Commission, M/o Jal Shakti

Note: '*': The average water resource of the Indus basin has been computed considering Ravi, Beas, Sutlej and Ghaggar rivers only.

'**': Excluding area of Indus above border, Lakshadweep Island and Andaman and Nicobar group of islands.

**Table 2.4: Total Renewable Internal Fresh Water Resources per Capita ($m^3$/yr) of Top 10 and Bottom 10 countries**

| Rank | Country | Total Internal Renewable Water Resources per Capita ($m^3$/yr) | Year |
|---|---|---|---|
| **1** | **2** | **3** | **4** |
| **Top 10 Countries** | | | |
| 1 | Brazil | 5661.00 | 2018 |
| 2 | Russia | 4312.00 | 2018 |
| 3 | Canada | 2850.00 | 2018 |
| 4 | United States | 2818.00 | 2018 |
| 5 | China | 2812.90 | 2018 |
| 6 | Colombia | 2145.00 | 2018 |
| 7 | Indonesia | 2018.70 | 2018 |
| 8 | Peru | 1641.00 | 2018 |
| **9** | **India** | **1446.00** | **2018** |
| 10 | Myanmar | 1002.80 | 2018 |
| **Bottom 10 Countries** | | | |
| 172 | Saint Vincent and the Grenadines | 0.10 | 2018 |
| 173 | Barbados | 0.08 | 2018 |
| 174 | Qatar | 0.06 | 2018 |
| 175 | Antigua and Barbuda | 0.05 | 2018 |
| 176 | Malta | 0.05 | 2018 |
| 177 | Saint Kitts and Nevis | 0.02 | 2018 |
| 178 | Nauru | 0.01 | 2018 |
| 179 | Bahrain | 0.00 | 2018 |
| 180 | Kuwait | 0.00 | 2018 |

Source: Food and Agriculture Organization, AQUASTAT data.
https://www.indexmundi.com/facts/indicators/ER.H2O.INTR.K3/rankings

**Table 2.5: Inland Fisheries Resources by States and Union Territories of India during 2021-22**

| Sl. No. | States/UTs | Rivers and Canals (km) | Small Reservoirs | | Medium & Large Reservoir | | Tanks and Ponds (Ha) | Brackish Water (Ha) | Beels/ Oxbow Lakes/ Derelict Water (Ha) | Any other than Rivers and Canals (Ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number | Area (Ha) | Number | Area (Ha) | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | Andhra Pradesh | 11514.00 | 90 | 34693.00 | 26 | 130698.00 | 347888.00 | 56215.00 | 130000.00 | 0.00 |
| 2 | Arunachal Pradesh | 10309.00 | 4 | 226.00 | 0 | 0.00 | 29087.00 | 0.00 | 1382.70 | 57894.80 |
| 3 | Assam | 10607.29 | 0 | 0.00 | 2 | 1863.00 | 85067.51 | 0.00 | 69719.20 | 404516.98 |
| 4 | Bihar | 21354.00 | 0 | 0.00 | 48 | 64466.00 | 114775.80 | 0.00 | 0.00 | 0.00 |
| 5 | Chhattisgarh | 3573.00 | 1757 | 43565.00 | 13 | 39035.00 | 117300.00 | 0.00 | 0.00 | 0.00 |
| 6 | Goa | 578.50 | 4 | 484.00 | 1 | 2964.00 | 101.00 | 198.86 | 0.00 | 0.00 |
| 7 | Gujarat | 3865.00 | 686 | 22427.00 | 227 | 203679.00 | 22000.00 | 187000.00 | 0.00 | 0.00 |
| 8 | Haryana | 7197.00 | 8 | 141.80 | 0 | 0.00 | 18458.20 | 0.00 | 0.00 | 0.00 |
| 9 | Himachal Pradesh | 3000.00 | 0 | 0.00 | 5 | 43785.00 | 873.82 | 0.00 | 0.00 | 0.00 |
| 10 | Jammu & Kashmir | 26211.00 | 6 | 4230.00 | 2 | 6000.00 | 1661.00 | 0.00 | 0.00 | 21396.00 |
| 11 | Jharkhand | 1800.00 | 412 | 28789.60 | 23 | 104363.00 | 86539.00 | 0.00 | 0.00 | 19936.00 |
| 12 | Karnataka | 9630.00 | 34 | 7595.00 | 49 | 265063.00 | 313304.00 | 8000.00 | 0.00 | 0.00 |
| 13 | Kerala | 3220.00 | 37 | 10491.00 | 10 | 23714.00 | 27625.00 | 65213.00 | 0.00 | 0.00 |
| 14 | Madhya Pradesh | 17088.00 | 3372 | 129470.00 | 27 | 230703.00 | 78580.00 | 0.00 | 0.00 | 0.00 |
| 15 | Maharashtra | 26065.00 | 2415 | 131366.72 | 81 | 128535.00 | 80190.30 | 12024.80 | 0.00 | 5560.00 |
| 16 | Manipur | 1647.00 | 5 | 960.00 | 1 | 1182.00 | 11892.80 | 0.00 | 29161.00 | 0 .00 |
| 17 | Meghalaya | 4776.76 | 7 | 717.53 | 0 | 0.00 | 4537.87 | 0.00 | 297.91 | 302.54 |
| 18 | Mizoram | 1750.00 | 3 | 10.00 | 2 | 8000.00 | 5494.70 | 0.00 | 10.00 | 0.00 |
| 19 | Nagaland | 1600.00 | 0 | 0.00 | 1 | 2258.00 | 3570.00 | 0.00 | 1110.00 | 0.00 |
| 20 | Odisha | 24878.73 | 603 | 34608.00 | 8 | 165771.00 | 153210.00 | 32587.00 | 180000.00 | 0.00 |
| 21 | Punjab | 868.00 | 12 | 686.75 | 1 | 3100.00 | 17476.20 | 0.00 | 0.00 | 0.00 |
| 22 | Rajasthan | 30000.00 | 2388 | 145823.00 | 48 | 254475.00 | 30266.00 | 50.00 | 0.00 | 0.00 |
| 23 | Sikkim | 3200.00 | 9 | 200.56 | NA | NA | 1579.00 | 0.00 | 0.00 | 0.00 |
| 24 | Tamil Nadu | 7240.00 | 54 | 16059.00 | 8 | 62015.00 | 218691.13 | 56000.00 | 7000.00 | 35283.84 |

**Contd…**

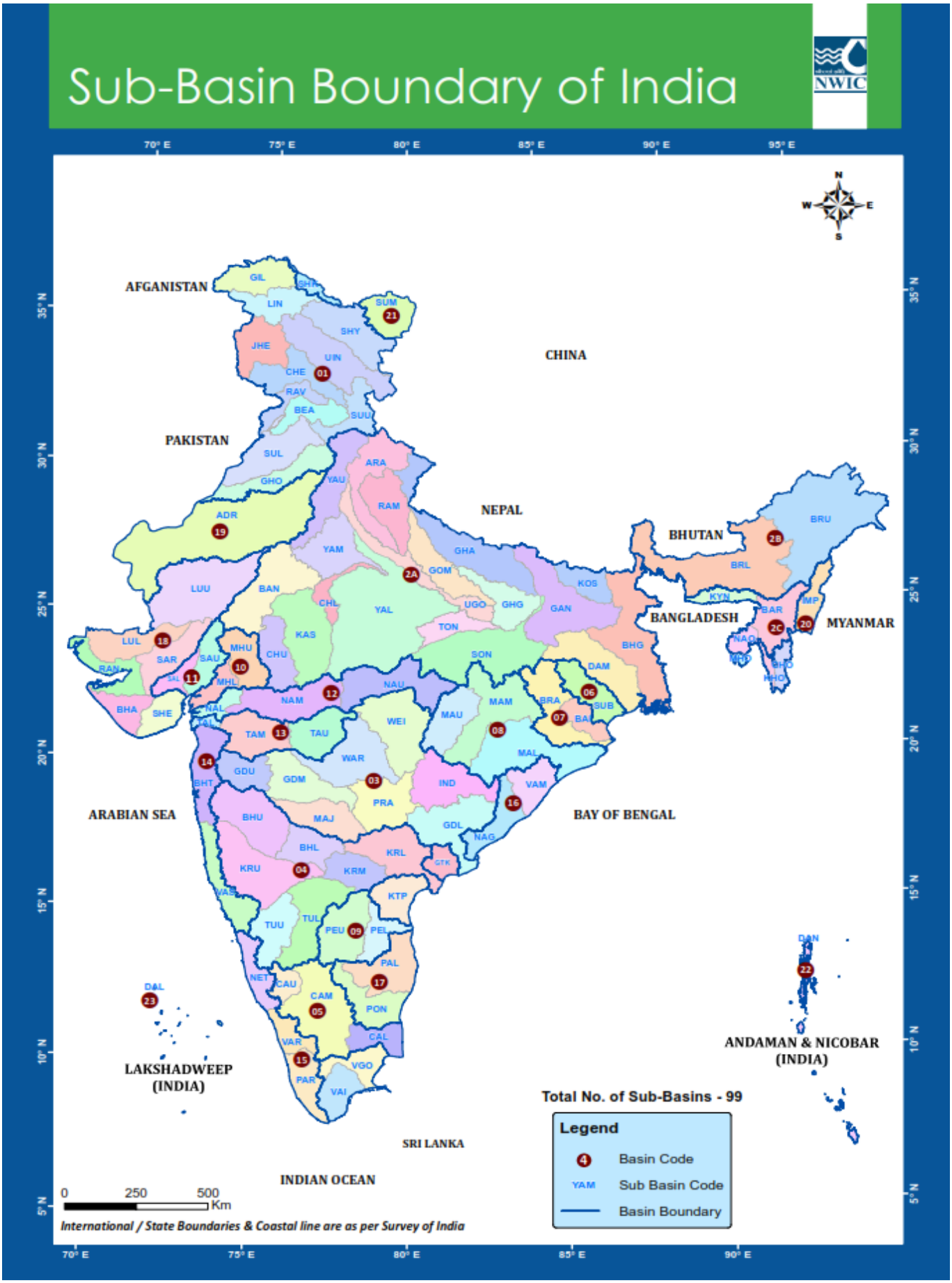
**Table 2.5: Inland Fisheries Resources by States and Union Territories of India during 2021-22**

| Sl. No. | States/UTs | Rivers and Canals (km) | Small Reservoirs | | Medium & Large Reservoir | | Tanks and Ponds (Ha) | Brackish Water (Ha) | Beels/ Oxbow Lakes/ Derelict Water (Ha) | Any other than Rivers and Canals (Ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number | Area (Ha) | Number | Area (Ha) | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 25 | Telangana | 2156.00 | 51 | 24302.00 | 40 | 184581.00 | 521581.00 | 0.00 | 0.00 | 0.00 |
| 26 | Tripura | 1080.00 | NA | NA | 1 | 3049.30 | 29913.20 | 0.00 | 0.00 | 0.00 |
| 27 | Uttarakhand | 2686.00 | 0 | 0.00 | 7 | 20587.00 | 890.89 | 0.00 | 0.00 | 50.00 |
| 28 | Uttar Pradesh | 70000.00 | 53 | 3223.00 | 29 | 144693.00 | 145808.68 | | 34935.10 | 1458000.00 |
| 29 | West Bengal | 13259.00 | 52 | 28050.00 | 31 | 14077.00 | 288385.00 | 91130.00 | 42081.00 | 150000.00 |
| 30 | A and N Islands | 0.00 | 7 | 367.00 | 0 | 0.00 | 202.27 | 618.81 | 0.00 | 0.00 |
| 31 | Chandigarh | 0.00 | 0 | 0.00 | 3 | 300.00 | 2.06 | 0.00 | 0.00 | 0.00 |
| 32 | Dadar & Nagar Haveli and Daman & Diu | 6.00 | 0 | 0.00 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 33 | Ladakh | 4570.00 | 1 | 1.50 | 1 | 250.00 | 7.52 | 97700.00 | 0.00 | 0.00 |
| 34 | Delhi | 50.00 | 0 | 0.00 | 0 | 0.00 | 10.00 | 0.00 | 0.00 | 0.00 |
| 35 | Lakshadweep | 0.00 | 0 | 0.0 | 0 | 0.00 | 184.00 | 0.00 | 0.00 | 0.00 |
| 36 | Puducherry | 395.42 | NA | 303.33 | NA | 1357.12 | 468.39 | 82.49 | 0.00 | 0.00 |
| **All India** | | **312934.70** | **12906** | **754832.81** | **504** | **2106106.30** | **2756042.34** | **606819.96** | **365696.91** | **2152940.16** |

Source: D/o Fisheries, M/o Fisheries, Animal Husbandry and Dairying

Note: Small Reservoirs<1000 Ha; Medium Reservoirs-1000 to 5000 Ha & Large Reservoirs>5000 Ha.

**Map 2: Sub-Basin Boundary of India**




Source: NWIC, D/o Water Resources, RD &GR, M/o Jal Shakti

**Table 2.6: Watersheds in India**

| Name of Basin & River Length | Basin Code | Sl. No. | Name of Sub-Basin | Sub Basin Code | No. of Watersheds | Area (Sq.km) | Size Range of Watershed (Sq.km) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Indus -1114 (2280) km | 1 | 1 | Gilgit | GIL | 37 | 27383.51 | 339.63 - 1018.93 |
| | | 2 | Lower Indus | LIN | 31 | 23980.48 | 319.30 - 1270.43 |
| | | 3 | Shyok | SHY | 53 | 38574.41 | 430.05 - 1375.26 |
| | | 4 | Upper Indus | UIN | 70 | 46434.87 | 383.02 - 973.92 |
| | | 5 | Jhelum | JHE | 44 | 29119.96 | 315.90 - 1322.17 |
| | | 6 | Chenab | CHE | 48 | 29914.09 | 319.76 - 1113.95 |
| | | 7 | Satluj Upper | SUU | 31 | 21467.32 | 383.54 - 962.37 |
| | | 8 | Ravi | RAV | 20 | 13600.91 | 390.23 - 1324.55 |
| | | 9 | Beas | BEA | 30 | 19164.22 | 388.75 - 1143.90 |
| | | 10 | Satluj Lower | SUL | 58 | 38468.82 | 329.08 - 1299.25 |
| | | 11 | Ghaghar and others | GHO | 47 | 29429.88 | 317.44 - 1157.91 |
| Ganga-2525 km | 2A | 12 | Yamuna Upper | YAU | 47 | 35919.24 | 324.97 - 1241.11 |
| | | 13 | Above Ramganga Confluence | ARA | 51 | 39072.93 | 434.54 - 1301.20 |
| | | 14 | Ghaghara | GHA | 76 | 58354.75 | 374.93 - 1300.81 |
| | | 15 | Ramganga | RAM | 40 | 30828.33 | 350.05 - 1420.36 |
| | | 16 | Upstream of Gomti confluence to Muzaffarnagar | UGO | 40 | 29545.43 | 315.03 - 1281.12 |
| | | 17 | Yamuna Middle | YAM | 43 | 34497.06 | 410.43 - 1232.25 |
| | | 18 | Gomti | GOM | 41 | 29765.26 | 333.29 - 1330.50 |
| | | 19 | Yamuna Lower | YAL | 98 | 124509.11 | 735.54 - 1781.43 |
| | | 20 | Banas | BAN | 64 | 51647.90 | 330.66 - 1432.97 |
| | | 21 | Gandak and others | GAN | 76 | 57083.81 | 332.23 - 1697.39 |
| | | 22 | Chambal Lower | CHL | 14 | 10936.96 | 405.59 - 1135.93 |
| | | 23 | Bhagirathi and others (Ganga Lower) | BHG | 75 | 64015.15 | 308.24 - 1777.56 |
| | | 24 | Ghaghara Confluence to Gomti confluence | GHG | 36 | 26434.92 | 372.40 - 1717.06 |
| | | 25 | Kosi | KOS | 19 | 17599.26 | 303.77 - 2073.34 |
| | | 26 | Kali Sindh and others up to Confluence with Parbati | KAS | 64 | 48492.91 | 429.86 - 1275.01 |
| | | 27 | Tons | TON | 23 | 16912.59 | 442.40 - 1173.36 |
| | | 28 | Chambal Upper | CHU | 30 | 25546.57 | 405.14 - 1403.97 |
| | | 29 | Sone | SON | 83 | 65104.54 | 380.66 - 1389.01 |
| | | 30 | Damodar | DAM | 60 | 42346.50 | 326.16 - 1301.09 |

**Contd…**

**Table 2.6: Watersheds in India**

| Name of Basin & River Length | Basin Code | Sl. No. | Name of Sub-Basin | Sub Basin Code | No. of Watersheds | Area (Sq.km) | Size Range of Watershed (Sq.km) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Brahmaputra-916 (2900) km | 2B | 31 | Brahmaputra Upper | BRU | 97 | 98840.64 | 476.11 - 1473.03 |
| | | 32 | Brahmaputra Lower | BRL | 83 | 87585.75 | 429.01 - 1502.67 |
| Barak and others | 2C | 33 | Barak | BAR | 47 | 27619.72 | 365.66 - 844.23 |
| | | 34 | Kynchiang and other South flowing rivers | KYN | 17 | 10181.26 | 311.85 - 788.75 |
| | | 35 | Naoch chara and others | NAO | 13 | 7713.58 | 392.34 - 857.52 |
| Godavari - 1465 km | 3 | 36 | Weinganga | WEI | 80 | 49635.39 | 305.64 - 971.62 |
| | | 37 | Wardha | WAR | 69 | 46242.83 | 361.22 - 945.71 |
| | | 38 | Godavari Middle | GDM | 55 | 35698.01 | 325.87 - 954.32 |
| | | 39 | Indravati | IND | 60 | 39580.00 | 343.14 - 1100.38 |
| | | 40 | Godavari Upper | GDU | 33 | 21443.23 | 331.11 - 987.06 |
| | | 41 | Pranhita and others | PRA | 57 | 35864.91 | 326.11 - 981.77 |
| | | 42 | Godavari Lower | GDL | 67 | 43531.89 | 304.77 - 989.28 |
| | | 43 | Manjra | MAJ | 45 | 30067.53 | 421.07 - 980.21 |
| Krishna - 1401 km | 4 | 44 | Bhima Upper | BHU | 71 | 44793.32 | 351.72 - 939.84 |
| | | 45 | Krishna Upper | KRU | 85 | 54505.99 | 322.33 - 963.80 |
| | | 46 | Bhima Lower | BHL | 36 | 23653.24 | 396.71 - 928.25 |
| | | 47 | Krishna Lower | KRL | 58 | 38670.68 | 277.58 - 970.03 |
| | | 48 | Krishna Middle | KRM | 36 | 22111.72 | 341.29 - 861.31 |
| | | 49 | Tungabhadra Lower | TUL | 59 | 41672.13 | 357.51 - 975.84 |
| | | 50 | Tungabhadra Upper | TUU | 45 | 28519.41 | 331.6 - 923.94 |
| Cauvery-800 km | 5 | 51 | Cauvery Middle | CAM | 86 | 57284.65 | 377.45 - 934.52 |
| | | 52 | Cauvery Upper | CAU | 18 | 10861.61 | 362.94 - 991.25 |
| | | 53 | Cauvery Lower | CAL | 28 | 17435.41 | 320.70 - 926.44 |
| Subernarekha | 6 | 54 | Subarnarekha | SUB | 45 | 25710.97 | 387.02 - 962.40 |
| Brahmani and Baitarni-799 km | 7 | 55 | Brahmani | BRA | 58 | 37419.14 | 332.75 - 971.23 |
| | | 56 | Baitarni | BAI | 21 | 14476.76 | 472.27 - 1175.08 |
| Mahanadi-851 km | 8 | 57 | Mahanadi Middle | MAM | 88 | 51888.18 | 301.22 - 902.46 |
| | | 58 | Mahanadi Upper | MAU | 48 | 29804.05 | 314.34 - 907.63 |
| | | 59 | Mahanadi Lower | MAL | 91 | 57971.31 | 320.05 - 1456.61 |

**Contd…**

**Table 2.6: Watersheds in India**

| Name of Basin & River Length | Basin Code | Sl. No. | Name of Sub-Basin | Sub Basin Code | No. of Watersheds | Area (Sq.km) | Size Range of Watershed (Sq.km) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Pennar - 597 km | 9 | 60 | Pennar Upper | PEU | 61 | 36271.67 | 310.23 - 926.97 |
| | | 61 | Pennar Lower | PEL | 29 | 18022.15 | 385.96 - 850.70 |
| Mahi-583 km | 10 | 62 | Mahi Upper | MHU | 41 | 24952.93 | 330.18 - 953.44 |
| | | 63 | Mahi Lower | MHL | 22 | 13197.73 | 371.05 - 872.94 |
| Sabarmati-371 km | 11 | 64 | Sabarmati Upper | SAU | 34 | 19808.34 | 313.38 - 828.34 |
| | | 65 | Sabarmati Lower | SAL | 17 | 11056.45 | 397.55 - 986.46 |
| Narmada-1312 km | 12 | 66 | Narmada Upper | NAU | 71 | 43192.68 | 327.06 - 986.00 |
| | | 67 | Narmada Middle | NAM | 63 | 40575.64 | 338.11 - 957.42 |
| | | 68 | Narmada Lower | NAL | 16 | 9780.19 | 385.73 - 943.31 |
| Tapi-724 km | 13 | 69 | Tapi Upper | TAU | 46 | 28047.22 | 322.12 - 937.28 |
| | | 70 | Tapi Lower | TAL | 6 | 3655.25 | 502.50 - 781.84 |
| | | 71 | Tapi Middle | TAM | 47 | 31766.60 | 365.64 - 937.44 |
| West flowing rivers from Tapi to Tadri | 14 | 72 | Bhatsol and others | BHT | 49 | 29039.28 | 300.92 - 897.89 |
| | | 73 | Vasishti and others | VAS | 47 | 27740.03 | 335.12 - 1007.97 |
| West flowing rivers from Tadri to Kanyakumari | 15 | 74 | Netravati and others | NET | 32 | 18985.55 | 319.89 - 928.92 |
| | | 75 | Varrar and others | VAR | 23 | 14239.35 | 363.17 - 978.16 |
| | | 76 | Periyar and others | PAR | 37 | 21906.89 | 342.52 - 899.36 |
| East flowing rivers between Mahanadi and Pennar | 16 | 77 | East flowing rivers between Godavari and Krishna | GTK | 17 | 11317.70 | 410.21 - 914.73 |
| | | 78 | East flowing rivers between krishna and Pennar | KTP | 41 | 23360.58 | 204.66 - 1417.33 |
| | | 79 | Vamsadhara and other | VAM | 34 | 21880.12 | 392.57 - 930.46 |
| | | 80 | Nagvati and other | NAG | 41 | 24296.93 | 352.52 - 924.40 |
| East flowing rivers between Pennar and Kanyakumari | 17 | 81 | Palar and other | PAL | 56 | 35412.74 | 292.51 - 957.26 |
| | | 82 | Ponnaiyar and other | PON | 46 | 28300.87 | 356.34 - 901.24 |
| | | 83 | Vaigai and others | VGO | 30 | 18454.67 | 316.52 - 940.21 |
| | | 84 | Vaippar and others | VAI | 33 | 20342.70 | 318.37 - 887.70 |

**Contd…**

**Table 2.6: Watersheds in India**

| Name of Basin & River Length | Basin Code | Sl. No. | Name of Sub-Basin | Sub Basin Code | No. of Watersheds | Area (Sq.km) | Size Range of Watershed (Sq.km) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| West flowing rivers of Kutch and Saurashtra including Luni | 18 | 85 | Luni Upper | LUU | 81 | 70210.78 | 381.48 - 1447.71 |
| | | 86 | Saraswati | SAR | 43 | 27151.49 | 308.99 - 1017.93 |
| | | 87 | Luni Lower | LUL | 42 | 29171.45 | 315.95 - 1418.64 |
| | | 88 | Drainage of Rann | RAN | 40 | 22850.24 | 327.17 - 968.30 |
| | | 89 | Bhadar and other West flowing rivers | BHA | 30 | 18521.08 | 332.94 - 965.57 |
| | | 90 | Shetrunji and other East flowing rivers | SHE | 32 | 18376.22 | 300.06 - 856.22 |
| Area of Inland drainage in Rajasthan | 19 | 91 | Area of Inland drainage in Rajasthan | ADR | 200 | 136768.48 | 326.27 - 1494.82 |
| Minor rivers draining into Myanmar and Bangladesh | 20 | 92 | Imphal and others | IMP | 29 | 16692.62 | 314.40 - 899.22 |
| | | 93 | Chhimtuipui & Others | CHO | 16 | 7879.11 | 359.61 - 655.10 |
| | | 94 | Khawthlangtuipui & others | KHO | 6 | 3848.14 | 312.59 - 881.89 |
| | | 95 | Muhury and others | MHO | 3 | 1682.35 | 519.82 - 607.58 |
| Area of North Ladakh not draining into Indus Basin | 21 | 96 | Sulmar | SUM | 33 | 22847.87 | 365.75 - 1081.27 |
| | | 97 | Shaksgam | SHK | 9 | 6787.06 | 608.55 - 1033.48 |
| Drainage area of Andaman & Nicobar Islands | 22 | 98 | Drainage Area of Andaman and Nicobar Islands | DAN | 16 | 7577.36 | 207.47 - 783.11 |
| Drainage area of Lakshadweep Islands | 23 | 99 | Drainage Area of Lakshadweep Islands | DAL | 1 | 669.71 | 669.71 - 669.71 |

Source: NWIC, D/o Water Resources, RD &GR, M/o Jal Shakti

Note: 1.The length of the basins as per River Basin Atlas of India, 2012 publication (https://indiawris.gov.in/downloads/RiverBasinAtlas_Full.pdf).

2. Indus Basin: Total length 2,880 km, out of which 1,114 km flows through India.
3. Brahmaputra Basin: Total length 2,900 km, out of which 916 km flows through India.
4. Watershed at a glance information is as per the updated data as on March, 2022.

**Table 2.7: Annual and Monthly Rainfall in India**

(In mm)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1901-10* | 19.7 | 22.4 | 24.2 | 37.1 | 49.5 | 147.8 | 273.5 | 254.9 | 161.4 | 60.8 | 21.5 | 15.9 | 1088.7 |
| 1911-20* | 20.2 | 25.4 | 32.6 | 36.2 | 64.8 | 186.7 | 268.4 | 247.1 | 165.6 | 78.6 | 36.5 | 12.5 | 1174.6 |
| 1921-30* | 25.6 | 23.3 | 23.2 | 40.6 | 61.5 | 167.9 | 315.9 | 256.9 | 180.4 | 77.1 | 35.0 | 18.0 | 1225.3 |
| 1931-40* | 17.8 | 31.8 | 28.3 | 40.6 | 66.4 | 190.5 | 308.1 | 263.4 | 176.9 | 79.3 | 33.1 | 14.4 | 1250.5 |
| 1941-50* | 27.0 | 24.4 | 29.8 | 42.0 | 71.2 | 165.3 | 322.0 | 264.7 | 192.0 | 72.7 | 29.7 | 15.0 | 1255.7 |
| 1951-60* | 23.6 | 16.0 | 28.9 | 33.6 | 66.9 | 162.9 | 307.9 | 271.7 | 183.9 | 98.9 | 24.0 | 11.4 | 1229.8 |
| 1961-70* | 15.9 | 20.4 | 28.2 | 36.9 | 58.8 | 159.9 | 292.3 | 262.7 | 177.9 | 69.1 | 24.1 | 18.5 | 1164.4 |
| 1971-80* | 15.3 | 21.9 | 24.1 | 36.6 | 59.2 | 172.3 | 279.6 | 263.2 | 156.5 | 76.9 | 36.4 | 14.2 | 1156.2 |
| 1981-90* | 18.2 | 25.9 | 36.5 | 43.2 | 67.2 | 164.6 | 285.5 | 263.1 | 172.2 | 72.9 | 27.0 | 20.3 | 1196.5 |
| 1991-2000* | 20.0 | 23.3 | 28.0 | 34.7 | 64.8 | 171.6 | 289.9 | 256.2 | 167.2 | 78.9 | 30.2 | 15.6 | 1180.1 |
| 2001 | 7.3 | 8.8 | 18.8 | 46.4 | 67.2 | 219.0 | 279.5 | 209.2 | 114.1 | 107.5 | 22.5 | 7.1 | 1107.3 |
| 2002 | 15.7 | 20.3 | 21.5 | 38.7 | 61.4 | 180.1 | 146.1 | 259.7 | 151.1 | 59.5 | 18.2 | 5.7 | 976.9 |
| 2003 | 7.6 | 45.6 | 33.2 | 35.4 | 39.1 | 184.5 | 316.6 | 254.9 | 191.3 | 100.5 | 15.5 | 18.6 | 1242.8 |
| 2004 | 25.7 | 8.8 | 11.3 | 59.0 | 88.9 | 162.9 | 243.4 | 248.9 | 124.5 | 92.2 | 15.8 | 4.6 | 1085.9 |
| 2005 | 28.1 | 41.7 | 42.5 | 37.7 | 46.1 | 143.1 | 334.2 | 190.3 | 206.8 | 99.2 | 27.2 | 11.2 | 1208.1 |
| 2006 | 17.7 | 11.9 | 35.6 | 32.6 | 74.9 | 141.8 | 287.6 | 281.3 | 178.7 | 51.8 | 34.6 | 13.1 | 1161.5 |
| 2007 | 1.7 | 36.7 | 35.2 | 30.6 | 46.7 | 194.2 | 286.4 | 257.4 | 206.6 | 55.6 | 14.4 | 15.3 | 1180.7 |
| 2008 | 18.4 | 19.3 | 41.2 | 29.5 | 43.7 | 201.9 | 244.8 | 265.6 | 165.0 | 51.6 | 25.5 | 11.0 | 1117.5 |
| 2009 | 12.0 | 12.0 | 14.2 | 25.1 | 56.0 | 85.7 | 280.5 | 192.4 | 139.5 | 71.4 | 53.7 | 11.1 | 953.7 |
| 2010 | 7.0 | 16.0 | 14.0 | 39.0 | 73.8 | 138.1 | 300.5 | 274.7 | 197.4 | 69.0 | 61.5 | 22.7 | 1213.3 |
| 2011 | 6.8 | 25.8 | 22.4 | 41.1 | 53.1 | 183.6 | 246.1 | 284.9 | 186.7 | 38.1 | 20.1 | 7.6 | 1116.0 |
| 2012 | 26.5 | 12.7 | 11.3 | 47.5 | 31.7 | 117.6 | 250.3 | 262.3 | 193.4 | 58.6 | 30.7 | 11.7 | 1054.3 |
| 2013 | 11.3 | 40.1 | 15.7 | 30.3 | 57.8 | 219.8 | 310.1 | 254.9 | 152.6 | 129.3 | 14.0 | 6.7 | 1242.6 |
| 2014 | 19.3 | 27.4 | 36.1 | 22.1 | 72.9 | 95.2 | 261.1 | 237.4 | 187.9 | 60.1 | 14.4 | 10.7 | 1044.7 |
| 2015 | 17.2 | 20.8 | 61.4 | 68.8 | 53.4 | 189.0 | 240.8 | 204.2 | 131.8 | 42.3 | 39.9 | 15.4 | 1085.0 |
| 2016 | 7.8 | 10.1 | 30.8 | 31.4 | 68.1 | 147.6 | 309.2 | 239.6 | 168.0 | 54.5 | 7.7 | 8.4 | 1083.1 |
| 2017 | 26.9 | 12.4 | 29.0 | 44.3 | 56.1 | 172.5 | 290.5 | 229.6 | 153.3 | 81.5 | 14.7 | 16.2 | 1127.1 |
| 2018 | 2.9 | 12.7 | 16.5 | 39.3 | 64.6 | 155.7 | 274.1 | 240.2 | 132.7 | 35.6 | 21.0 | 14.7 | 1020.8 |
| 2019 | 18.5 | 33.1 | 18.7 | 31.5 | 51.3 | 113.5 | 298.8 | 299.9 | 259.5 | 110.1 | 31.6 | 19.2 | 1288.8 |
| 2020 | 28.3 | 12.1 | 44.7 | 42.7 | 71.8 | 195.6 | 257.1 | 327.8 | 178.0 | 78.3 | 29.2 | 17.0 | 1289.6 |
| 2021 | 20.2 | 7.6 | 16.7 | 31.1 | 107.8 | 182.4 | 266.2 | 196.3 | 229.6 | 100.8 | 56.5 | 20.5 | 1236.4 |

Source: India Meteorological Department (IMD), Ministry of Earth Sciences

* Denotes average for the period.

## Table 2.8: Status of Monitored Glacial Lakes and Water Bodies

| Month | No. of Glacial Lakes/Water Bodies Monitored during the Month (Total Nos. 477) | Details of GLs/WBs showing area Increased (≥ 5%), Decreased (≥ 5%), No Change (remains within ± 5%) w.r.t. 2009 inventory area | | |
|---|---|---|---|---|
| | | Increased (Nos.) | Decreased (Nos.) | No Change (Nos.) |
| 1 | 2 | 3 | 4 | 5 |
| **June – Oct, 2017** | | | | |
| June, 2017 | 192 | 58 | 90 | 44 |
| July,2017 | 176 | 47 | 87 | 42 |
| August, 2017 | 165 | 37 | 86 | 42 |
| September, 2017 | 273 | 80 | 116 | 77 |
| October, 2017 | 326 | 97 | 122 | 107 |
| **June – Oct, 2018** | | | | |
| June, 2018 | 380 | 156 | 29 | 195 |
| July, 2018 | 294 | 129 | 32 | 133 |
| August, 2018 | 208 | 117 | 13 | 78 |
| September, 2018 | 285 | 175 | 15 | 95 |
| October, 2018 | 320 | 192 | 25 | 103 |
| **June – Oct, 2019** | | | | |
| June, 2019 | 249 | 150 | 15 | 82 |
| July, 2019 | 259 | 161 | 34 | 62 |
| August, 2019 | 254 | 178 | 23 | 51 |
| September, 2019 | 276 | 203 | 14 | 58 |
| October, 2019 | 314 | 228 | 25 | 60 |
| **June – Oct, 2020** | | | | |
| June, 2020 | 218 | 147 | 26 | 45 |
| July, 2020 | 173 | 104 | 28 | 41 |
| August, 2020 | 267 | 118 | 70 | 79 |
| September, 2020 | 222 | 69 | 79 | 74 |
| October, 2020 | 372 | 136 | 115 | 121 |
| **June – Oct, 2021** | | | | |
| June, 2021 | 209 | 75 | 70 | 64 |
| July, 2021 | 169 | 59 | 60 | 50 |
| August, 2021 | 114 | 37 | 60 | 17 |
| September, 2021 | 398 | 92 | 200 | 106 |
| October, 2021 | 367 | 79 | 217 | 71 |

Source: Morphology Directorate, Central Water Commission, M/o Jal Shakti

Note: less No. of Glacial Lakes/Water Bodies Monitored during various months due to clouds.

**Table 2.9: Glacial Lakes with Significant Change in Water Spread**

**(a) Lakes with increasing Water Spread**

| Sl. No. | UID | State Name | Lake_ID | Water Spread Area in Ha | % Diff in Water Spread Area w.r.t. Inventory Area | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2009 (Inventory) | 2021 | 2020 | 2019 | 2018 | 2017 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1. | AP_84 | Arunachal Pradesh | 03_91C_034 | 134 | 20.15 | Cloud | Cloud | -1.62 | Cloud |
| 2. | AP_95 | Arunachal Pradesh | 03_91C_049 | 57 | 31.58 | Cloud | Cloud | Cloud | Cloud |
| 3. | AP_100 | Arunachal Pradesh | 03_91C_064 | 89 | 20.22 | Cloud | 7.87 | -1.14 | -20.20 |
| 4. | AP_135 | Arunachal Pradesh | 03_91D_041 | 115 | 52.17 | Cloud | 10.43 | -1.20 | 2.38 |
| 5. | AP_206 | Arunachal Pradesh | 03_92E_001 | 45 | 64.44 | Cloud | 35.56 | -8.89 | -8.46 |
| 6. | HP_3 | Himachal Pradesh | 01_52H_002 | 62 | 64.52 | 70.97 | 72.58 | 74.58 | 44.58 |
| 7. | HP_5 | Himachal Pradesh | 01_52H_004 | 46 | 219.57 | 260.87 | 252.17 | 243.48 | 157.89 |
| 8. | HP_12 | Himachal Pradesh | 01_53E_001 | 72 | 29.17 | 140.28 | 98.61 | 90.54 | 81.65 |
| 9. | JK_5 | Jammu & Kashmir | 01_42H_005 | 52 | 25.00 | 23.08 | 32.69 | 23.08 | 25.11 |
| 10. | JK_159 | Jammu & Kashmir | 01_43N_032 | 49 | 20.41 | 65.31 | 34.69 | 34.69 | 30.08 |
| 11. | JK_187 | Jammu & Kashmir | 01_52C_003 | 45 | 20.00 | 48.89 | 73.33 | 73.33 | 27.36 |
| 12. | SK_5 | Sikkim | 03_77D_005 | 79 | 20.25 | 40.51 | 49.37 | 41.77 | -23.83 |
| 13. | SK_19 | Sikkim | 03_78A_013 | 63 | 41.27 | 38.10 | 66.67 | 57.07 | 28.29 |
| 14. | SK_20 | Sikkim | 03_78A_014 | 94 | 63.83 | 59.57 | 65.96 | 65.96 | 5.2 |
| 15. | SK_26 | Sikkim | 03_78A_021 | 56 | 44.64 | 44.64 | 37.50 | -39.29 | -87.99 |

Source: Morphology Directorate, Central Water Commission, M/o Jal Shakti

UID- Unique identifier of the glacial lake with the letters denote the State (in case of India)
Lake_ID-Each glacial lake has a unique number in the digital database. The numbering is done sequentially within each 1:250,000 reference grid. The first two digits indicate the basin number (01 - Indus, 02 - Ganga and 03 - Brahmaputra). The next three characters depict the reference number of the 1:250,000 SOI topo sheet. The last three-digit number indicates lake number within a grid of 1:250,000 SOI topo sheet.

**Table 2.9: Glacial Lakes with Significant Change in Water Spread**

**(b) Lakes with decreasing Water Spread**

| Sl. No. | UID | State Name | Lake_ID | Water Spread Area in Ha | % Diff in Water Spread Area w.r.t. Inventory Area | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 2009 (Inventory) | 2021 | 2020 | 2019 | 2018 | 2017 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1. | AP_49 | Arunachal Pradesh | 03_82O_042 | 44 | -34.09 | -6.82 | 25.00 | 1.54 | 15.97 |
| 2. | AP_77 | Arunachal Pradesh | 03_83A_012 | 63 | -20.63 | 4.76 | 39.68 | Cloud | Cloud |
| 3. | HP_10 | Himachal Pradesh | 01_53A_002 | 13679 | -36.27 | -13.26 | 7.29 | -1.29 | -2.89 |
| 4. | JK_99 | Jammu & Kashmir | 01_43J_021 | 1238 | -26.41 | -11.79 | -11.15 | -11.15 | -11.51 |
| 5. | JK_111 | Jammu & Kashmir | 01_43K_010 | 66 | -24.24 | 10.61 | 22.73 | 6.72 | 4.13 |
| 6. | JK_157 | Jammu & Kashmir | 01_43N_030 | 86 | -29.07 | -3.49 | 3.49 | 2.17 | -7.31 |
| 7. | JK_191 | Jammu & Kashmir | 01_52G_003 | 1502 | -33.56 | -1.86 | 6.46 | 6.47 | -7.27 |
| 8. | JK_198 | Jammu & Kashmir | 01_52J_002 | 67 | -22.39 | 8.96 | 4.48 | 4.72 | -13.97 |
| 9. | JK_205 | Jammu & Kashmir | 01_52J_009 | 57 | -35.09 | 24.56 | 42.11 | 25.32 | -6.53 |
| 10. | SK_8 | Sikkim | 03_77D_008 | 46 | -34.78 | -2.17 | 10.87 | 12.21 | 37.00 |
| 11. | SK_11 | Sikkim | 03_78A_003 | 58 | -24.14 | 8.62 | 55.17 | 220.69 | Cloud |
| 12. | UK_2 | Uttarakhand | 02_53K_002 | 1597 | -22.17 | -20.66 | -3.82 | -8.27 | -16.62 |
| 13. | UK_10 | Uttarakhand | 02_53P_002 | 734 | -60.63 | -50.68 | -39.10 | -38.56 | -40.59 |
| 14. | UK_11 | Uttarakhand | 02_53P_003 | 1078 | -40.91 | -12.24 | 3.71 | 2.38 | -31.82 |

Source: Morphology Directorate, Central Water Commission, M/o Jal Shakti

UID- Unique identifier of the glacial lake with the letters denote the State (in case of India).
Lake_ID-Each glacial lake has a unique number in the digital database. The numbering is done sequentially within each 1:250,000 reference grid. The first two digits indicate the basin number (01 - Indus, 02 - Ganga and 03 - Brahmaputra). The next three characters depict the reference number of the 1:250,000 SOI topo sheet. The last three-digit number indicates lake number within a grid of 1:250,000 SOI topo sheet.

**Table 2.10: State-wise Distribution of Hydro-Meteorological Observations Sites of CWC**
**(as on 01.01.2022)**

| Sl. No. | Name of States/UTs | Type of Site | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | G | GD | GDQ | GDS | GDSQ | GQ | SG&Met | WQSS | Total |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | Andhra Pradesh | 10 | 16 | 4 | 0 | 14 | 1 | 8 | 2 | 55 |
| 2 | Arunachal Pradesh | 7 | 2 | 8 | 0 | 9 | 10 | 18 | 0 | 54 |
| 3 | Assam | 7 | 9 | 23 | 1 | 26 | 53 | 5 | 0 | 124 |
| 4 | Bihar | 60 | 28 | 5 | 2 | 22 | 2 | 0 | 0 | 119 |
| 5 | Chhattisgarh | 11 | 9 | 2 | 1 | 18 | 0 | 14 | 8 | 63 |
| 6 | Dadar & Nagar Haveli | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 7 | Delhi | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 3 |
| 8 | Goa | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 9 | Gujarat | 20 | 16 | 4 | 0 | 9 | 0 | 6 | 1 | 56 |
| 10 | Haryana | 3 | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 10 |
| 11 | Himachal Pradesh | 6 | 11 | 0 | 4 | 6 | 0 | 23 | 0 | 50 |
| 12 | Jammu & Kashmir | 15 | 7 | 3 | 7 | 6 | 0 | 17 | 0 | 55 |
| 13 | Jharkhand | 10 | 19 | 4 | 0 | 6 | 1 | 19 | 6 | 65 |
| 14 | Karnataka | 7 | 18 | 15 | 0 | 25 | 2 | 4 | 0 | 71 |
| 15 | Kerala | 0 | 14 | 2 | 0 | 24 | 0 | 0 | 0 | 40 |
| 16 | Ladakh | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 17 | Madhya Pradesh | 57 | 46 | 16 | 0 | 27 | 1 | 10 | 1 | 158 |
| 18 | Maharashtra | 34 | 33 | 15 | 1 | 28 | 3 | 14 | 0 | 128 |
| 19 | Manipur | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| 20 | Meghalaya | 4 | 5 | 5 | 1 | 3 | 1 | 2 | 0 | 21 |
| 21 | Mizoram | 1 | 15 | 0 | 6 | 5 | 0 | 0 | 0 | 27 |
| 22 | Nagaland | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 23 | Odisha | 49 | 7 | 2 | 0 | 22 | 1 | 5 | 29 | 115 |
| 24 | Puducherry | | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| 25 | Punjab | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 26 | Rajasthan | 17 | 6 | 8 | 0 | 8 | 0 | 4 | 2 | 45 |
| 27 | Sikkim | 0 | 0 | 10 | 0 | 1 | 6 | 8 | 13 | 38 |
| 28 | Tamil Nadu | 0 | 20 | 21 | 0 | 21 | 0 | 1 | 0 | 63 |
| 29 | Telangana | 12 | 12 | 4 | 0 | 8 | 1 | 12 | 0 | 49 |
| 30 | Tripura | 1 | 5 | 0 | 5 | 3 | 2 | 0 | 0 | 16 |
| 31 | Uttar Pradesh | 71 | 44 | 13 | 1 | 46 | 4 | 4 | 27 | 210 |
| 32 | Uttarakhand | 23 | 31 | 4 | 6 | 9 | 0 | 7 | 16 | 96 |
| 33 | West Bengal | 18 | 22 | 8 | 2 | 21 | 10 | 6 | 7 | 94 |
| **Grand Total** | | **451** | **403** | **183** | **37** | **370** | **99** | **187** | **112** | **1842** |

Source: RDC-II Directorate, Central Water Commission, M/o Jal Shakti

Note: 'G': Gauge; 'GD': Gauge & Discharge; 'GDQ': Gauge, Discharge & Water Quality; 'GDS': Gauge, Discharge & Sediment; 'GDSQ': Gauge, Discharge, Sediment & Water Quality; 'GQ': Gauge & Water Quality; 'SG&Met': Snow Gauge & Meteorological; 'WQSS': Water Quality Sampling Station.

**Table 2.11: Basin-wise Distribution of Hydro-Meteorological Observation Sites of CWC**

**(as on 01.01.2022)**

| Sl. No. | Basin Name | G | GD | GDQ | GDS | GDSQ | GQ | Excl. Met | WQSS | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Brahmani & Baitarni | 12 | | | | 11 | 1 | 1 | 15 | 40 |
| 2 | Cauvery | | 13 | 17 | | 24 | | | | 54 |
| 3 | East Flowing rivers between Mahanadi and Pennar | 13 | 2 | | | 5 | | | 5 | 25 |
| 4 | East Flowing rivers between Pennar and Kanyakumari | | 19 | 10 | | 8 | | 1 | | 38 |
| 5 | Godavari | 48 | 43 | 13 | | 32 | 4 | 17 | | 157 |
| 6 | Krishna | 14 | 14 | 12 | | 29 | 3 | 18 | | 90 |
| 7 | Mahanadi | 30 | 2 | 1 | | 22 | | 6 | 15 | 76 |
| 8 | Mahi | 10 | 4 | 2 | | 3 | | 1 | | 20 |
| 9 | Narmada | 18 | 35 | 6 | | 11 | 1 | 2 | | 73 |
| 10 | Pennar | | 4 | 4 | | 4 | | | | 12 |
| 11 | Sabarmati | 7 | 4 | 1 | | 1 | | 5 | | 18 |
| 12 | Subarnarekha | 6 | 2 | 1 | | 6 | | | 1 | 16 |
| 13 | Tapi | 17 | 18 | 1 | 1 | 3 | | 7 | 8 | 55 |
| 14 | West Flowing rivers from Tadri to Kanyakumari | | 16 | 9 | | 26 | | | | 51 |
| 15 | West Flowing rivers from Tapi to Tadri | 7 | 6 | 4 | | 5 | | 3 | | 25 |
| 16 | West Flowing rivers of Kutch and Saurashtra including Luni | 3 | 10 | 2 | | 3 | | 4 | | 22 |
| 17 | Ganga/Brahmaputra/Meghna/Barak | 241 | 186 | 97 | 22 | 166 | 90 | 89 | 68 | 959 |
| 18 | Indus Basin | 23 | 16 | 3 | 11 | 8 | | 33 | | 94 |
| 19 | Minor rivers draining into Myanmar and Bangladesh | 2 | 9 | | 3 | 3 | | | | 17 |
| **Grand Total** | | **451** | **403** | **183** | **37** | **370** | **99** | **187** | **112** | **1842** |

Source: RDC-II Directorate, Central Water Commission, M/o Jal Shakti

Note: 'G': Gauge Site; 'GQ': Gauge and Water Quality Site; 'GD': Gauge and Discharge Site; 'GDS':Gauge, Discharge & Sediment Site; 'GDQ': Gauge, Discharge & Water Quality Site; 'GDSQ': Gauge, Discharge, Sediment and Water Quality Site; 'Exl. Met': Exclusive Met Sites; 'WQSS': Water Quality Sampling Station.

## Table 2.12: Tolerance and Classification of Water

As per CPCB, tolerance limits of parameters are specified as per classified use of water depending on various uses of water. The following classifications have been adopted in India.

**Designated Best Uses of Water**

| Designated Best Use | Class | Criteria |
|---|---|---|
| Drinking Water Source without conventional treatment but after disinfection | A | 1.Total Coliforms Organism MPN/100ml shall be 50 or less<br>2. pH between 6.5 and 8.5<br>3. Dissolved Oxygen 6mg/l or more<br>4. Biochemical Oxygen Demand 5 days 20°C, 2mg/l or less |
| Outdoor bathing (Organised) | B | 1.Total Coliforms Organism MPN/100ml shall be 500 or less<br>2. pH between 6.5 and 8.5<br>3. Dissolved Oxygen 5mg/l or more<br>4. Biochemical Oxygen Demand 5 days 20 °C, 3mg/l or less |
| Drinking Water Source after conventional treatment and disinfection | C | 1. Total Coliforms Organism MPN/100ml shall be 5000 or less<br>2. pH between 6 and 9<br>3. Dissolved Oxygen 4mg/l or more<br>4. Biochemical Oxygen Demand 5 days 20 °C, 3mg/l or less |
| Propagation of Wild life and Fisheries | D | 1. pH between 6.5 and 8.5<br>2. Dissolved Oxygen 4mg/l or more<br>3. Free Ammonia (as N) 1.2 mg/l or less |
| Irrigation, Industrial Cooling, Controlled Waste disposal | E | 1. pH between 6.0 and 8.5<br>2. Electrical Conductivity at 25 °C micro mhos/cm, maximum 2250<br>3. Sodium absorption Ratio Max. 26<br>4. Boron Max. 2mg/l |

Source: CPCB, M/o Environment, Forest & Climate Change (as per the latest data available on the site) (https://cpcb.nic.in/wqm/Designated_Best_Use_Water_Quality_Criteria.pdf)

**Table 2.13: Water Quality Standards in India**

| Sl. No. | Characteristics | Designated Best Use | | | | |
|---|---|---|---|---|---|---|
| | | A | B | C | D | E |
| 1 | Dissolved Oxygen (DO) mg/l. min | 6 | 5 | 4 | 4 | - |
| 2 | Biochemical Oxygen demand (BOD) mg/l. max | 2 | 3 | 3 | - | - |
| 3 | Total coliform organisms MPN/100 ml. max | 50 | 500 | 5000 | - | - |
| 4 | pH value | 6.5-8.5 | 6.5-8.5 | 6.0-9.0 | 6.5-8.5 | 6.0-8.5 |
| 5 | Colour. Hazen units. max | 10 | 300 | 300 | - | - |
| 6 | Odour | Un-objectionable | | | - | - |
| 7 | Taste | Tasteless | - | - | - | - |
| 8 | Total dissolved solids. mg/l. max | 500 | - | 1500 | - | 2100 |
| 9 | Total hardness (as $CaCO_3$),mg/l. max | 200 | - | - | - | - |
| 10 | Calcium hardness (as $CaCO_3$), mg/l. max | 200 | - | - | - | - |
| 11 | Magnesium hardness (as $CaCO_3$), mg/l. max. | 200 | - | - | - | - |
| 12 | Copper (as Cu).mg/l. max | 1.5 | - | 1.5 | - | - |
| 13 | Iron (as Fe). Mg/l max | 0.3 | - | 0.5 | - | - |
| 14 | Manganese (as Mn).mg/l. max | 0.5 | - | - | - | - |
| 15 | Chloride (as Cl). mg/l. max | 250 | - | 600 | - | 600 |
| 16 | Sulphates (as SO4). mg/l. max | 400 | - | 400 | - | 1 |
| 17 | Nitrate (as NO3). mg/l. max | 20 | - | 50 | - | - |
| 18 | Fluorides (as F). mg/l. max | 1.5 | 1.5 | 1.5 | - | - |
| 19 | Phenolic compounds (as $C_2H_5OH$). mg/l. max | 0.002 | 0.005 | 0.005 | - | - |
| 20 | Mercury (as Hg). mg/l. max | 0.001 | - | - | - | - |
| 21 | Cadmium (as Cd).mg/l. max | 0.01 | - | 0.01 | - | - |
| 22 | Selenium (as Se).mg/l. max | 0.01 | - | 0.05 | - | - |
| 23 | Arsenic (as As).mg/l. max | 0.05 | 0.2 | 0.2 | - | - |
| 24 | Cyanide (as Pb).mg/l. max | 0.05 | 0.05 | 0.05 | - | - |
| 25 | Lead (as Pb).mg/l. max | 0.1 | - | 0.1 | - | - |
| 26 | Zinc (as Zn).mg/l. max | 15 | - | 15 | - | - |
| 27 | Chromium (as Cr6+ ).mg/l. max | 0.05 | - | 0.05 | - | - |
| 28 | Anionic detergents (sa MBAS). mg/l. max | 0.2 | 1 | 1 | - | - |
| 29 | Barium (as Ba).mg/l. max | 1 | - | - | - | - |
| 30 | Free Ammonia (as N)). Mg/l. max | - | - | - | 1.2 | - |
| 31 | Electrical Conductivity. Micromhos/cm. max. | - | - | - | - | 2250 |
| 32 | Sodium absorption ratio. max | - | - | - | - | 26 |
| 33 | Boron. Mg/l. max | - | - | - | - | 2 |

Source: 'Hydrological Data (Un-classified) Book-2021', HD Directorate, CWC, M/o Jal Shakti (as per the latest availability of data)

Note: Basin-wise details of Water Quality Parameters are given in 'Hydrological Data (Un-classified) Book-2021.'

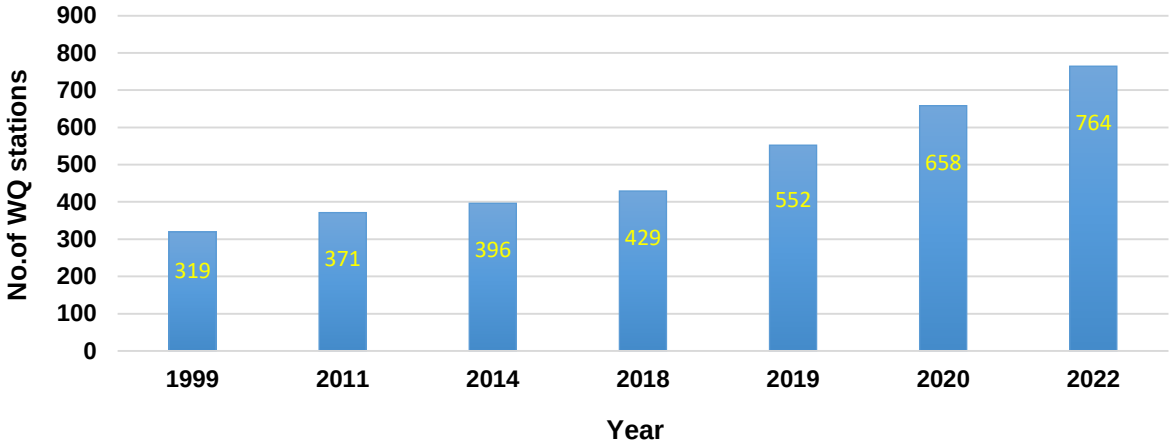
## 2.3 Water Quality Monitoring Activities of CWC during 2022

i. Being the apex national body for development of water resources in the country, water quality monitoring activities of CWC in the year 2022 are focusing upon:
   (i) Establishment of baseline water quality
   (ii) Assessment of suitability of water for various uses
   (iii) Detection of trends in water quality changes.
   (iv) Dissemination of water quality information upon request

ii. In the year 2022, Central Water Commission is observing water quality at 764 key locations covering important river basins of India following 'Guidelines of Water Quality Monitoring, 2017' published by Water Quality Assessment Authority.

iii. From the 658 key locations in the year 2020, 106 more water quality monitoring locations are added as per expansion plan in the area of WQ network given in Figure-5 below:

**Figure-5: Expansion of Water Quality Network of CWC**




iv. CWC follows a three-tier laboratory system which consists of Level I, II and III types of laboratories

| | |
|---|---|
| Level-I | •378 labs at field WQ monitoring stations<br>•06 in-situ parameters (Colour, Odour, Temperature pH, Electrical Conductivity and Dissolved Oxygen) |
| Level-II | •18 labs located at division offices<br>•NABL Accreditation for 14 labs<br>•25 physico-chemical and bacteriological parameters |
| Level-III | •5 regional labs (All NABL Accredited)<br>•25 physico-chemical and bacteriological parameters and 16 heavy metals and pesticides parameters |

Note: Samples have been collected thrice in a month from all sites for water quality analysis since June, 2021.

v. In 2022, 2 WQ laboratories of CWC located at Berhampore (West Bengal) and Bhopal (Madhya Pradesh) received NABL accreditation bringing 19 out of 23

laboratories (Level-II/III) of CWC accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) in the field of testing in accordance with ISO/IEC 17025:2017.

vi. The list of parameters being analysed in CWC labs during 2022 are given below:

| **Level I – 378 labs** | **Level II – 18 labs** | **Level III – 5 labs** |
|---|---|---|
| Temperature | Temperature | Trace & Toxic metals (9 nos.) |
| Colour | Electrical Conductivity | |
| Odour | Total Dissolved Solids | Arsenic |
| pH | pH | Cadmium |
| Dissolved Oxygen | Dissolved Oxygen (DO) | Chromium |
| Electrical Conductivity | Biochemical Oxygen Demand | Copper |
| | Chemical Oxygen Demand | Lead |
| Total= 06 Nos. | Turbidity | Iron |
| | Ammonia | Mercury |
| | Sodium | Nickel |
| | Calcium | Zinc |
| | Magnesium | *Pesticides (7 nos.)* |
| | Potassium | Alpha, Beta or Gamma BHC |
| | Boron | |
| | Carbonate | O,P' and P,P' DDT |
| | Bicarbonate | Aldrin, Dieldrin |
| | Fluoride | Alpha and Beta Endosulfan |
| | Chloride | |
| | Sulphate | Carbaryl (Carbamate) |
| | Nitrate | Malathion, 2-4 D, Methyl Parathion |
| | Nitrite | |
| | Silicate | Anilophos, Chlorpyrifos |
| | Phosphate | Total= 25+16= 41 Nos. |
| | Total Coliform | |
| | Fecal Coliform | |
| | Total= 25 Nos. | |

Source: RDC-II Directorate, CWC, M/o Jal Shakti

## 2.4 The Dam Safety Act, 2021

i. The Government of India brought the Dam Safety Bill, 2019 which was passed by the Lok Sabha on 02.08.2019 and by the Rajya Sabha on 02.12.2021. It received the assent of the Hon'ble President of India on the 13th December, 2021. Accordingly, the Dam Safety Act, 2021 was notified in the Gazette of India on 14th December, 2021. Vide Gazette notification dated 28th Dec 2021, the Central Government appointed 30th Dec., 2021 as the date on which the provisions of the said Act shall come into force.

ii. Dam Safety Act (DSA), 2021 provides for surveillance, inspection, operation and maintenance of the specified dam for prevention of dam failure related disasters and to provide for institutional mechanism to ensure their safe functioning and for matters connected therewith or incidental thereto.

(i) The Act extends to the whole of India

(ii) It applies to the owner of every specified dam being a public sector undertaking or institution or a body owned or controlled by the Central Government or a State Government or jointly by one or more Governments, as the case may be.

(iii) 'Owner of specified dam' means the Central Government or a State Government or jointly by one or more Governments or public sector undertaking or local authority or company and any or all of such persons or organisations, who own, control, operate, or maintain a specified dam.

(iv) 'Specified dam' means a dam constructed before or after the commencement of this Act, which is

(I) Above fifteen metres in height, measured from the lowest portion of the general foundation area to the top of dam; or

(II) between ten metres to fifteen metres in height and satisfies at least one of the following, namely:

a) the length of crest is not less than five hundred metres; or

b) the capacity of the reservoir formed by the dam is not less than one million cubic metres; or

c) the maximum flood discharge dealt with by the dam is not less than two thousand cubic metres per second; or

d) the dam has especially difficult foundation problems; or

e) the dam is of unusual design.

### 2.4.1 Institutional mechanism under Dam Safety Act-2021

i. National Committee on Dam Safety (NCDS) to discharge functions to prevent dam failure related disasters and to maintain standards of dam safety and it shall evolve dam safety policies and recommend necessary regulations as may be required for that purpose. The NCDS has come into force from 18th Feb, 2021 as per the gazette of India notification dated 17th Feb., 2021. NCDS consist of total 21 members (Section 5(1) of DSA):

(i) Chairman, CWC- Chairperson, ex-officio;

(ii) not exceeding ten representatives of the Central Government not below the rank of Joint Secretary - Members, ex-officio;

(iii) Not exceeding seven representatives of the State Government of the level of Engineer-in-chief or equivalent - Members, ex-officio; and

(iv) Not exceeding three specialists in the field of dam safety and allied fields - Members.

ii. National Dam Safety Authority (NDSA) as a regulatory body to implement the policy, guidelines and standards for proper surveillance, inspection and maintenance of specified dams and address unresolved points of issues between the State Dam Safety Organisation of two States, or between the State Dam Safety Organisation of a State and the owner of a dam in that State, and in certain cases, such as dams extending in two or more States or dams of one State falling under the territories of another State. It shall also perform the role of State Dam Safety Organisation thereby eliminating potential causes for inter-State conflicts (Section 8 of DSA). NDSA is headed by an officer not below the rank of Additional Secretary to GoI or equivalent appointed by Central Govt. Govt of India has notified the establishment of the National Dam Safety Authority (NDSA) on 17$^{th}$ Feb., 2022.

iii. State Committee on Dam Safety (SCDS) in States and UTs to ensure proper surveillance, inspection, operation and maintenance of all specified dams in that State and ensure their safe functioning (Section 11(1) of DSA). The functions of SCDS are defined in the third Schedule of the Act. The SCDS shall be headed by the Engineer-in-Chief or equivalent level officer of the department of the State/UT responsible for Dam Safety.

iv. State Dam Safety Organisation (SDSO) in States and UTs having specified dams which will be manned by officers with sufficient experience in the field of safety of dams (Section 14(1) of DSA). SDSO shall keep perpetual surveillance, carry out inspections, and monitor the operation and maintenance of all specified dams falling under their jurisdiction to ensure continued safety of such specified dams and take such measures as may be necessary to address safety concerns. States having more than thirty specified dams, the SDSO shall be headed by an officer, not below the rank of Chief Engineer or equivalent, and in all other cases, the SDSO shall be headed by an officer, not below the rank of Superintendent Engineer or equivalent.

v. Dam Safety Unit (DSU) for each specified dam, the owner shall, within the operation and maintenance establishment, provide a dam safety unit consisting of such competent levels of engineers as may be specified by the regulations (Section 30 of DSA).

### 2.4.2 Other important provisions under the Dam Safety Act-2021

i. Funds for Maintenance and Repairs- As per Section 21 of Dam Safety Act, every owner of the specified dam shall earmark sufficient and specific funds for maintenance and repairs of the specified dam and to implement the recommendations of the State Dam Safety Organisation.

ii. Regular Inspections - As per Section 31(1) of Dam Safety Act, every owner of dam shall undertake each year, through their dam safety unit, a pre-monsoon and post monsoon inspection in respect of each such dam.

iii. Special Inspection- As per Section 31(2) of Dam Safety Act, every owner of a specified dam shall inspect or cause to be inspected every specified dam by the dam safety unit, during and after every flood, earthquake or any other natural or man-made calamities, or if any sign of distress or unusual behaviour is noticed in the dam.

iv. Dam Instrumentation - As per Section 32(1) of Dam Safety Act, every owner of a specified dam shall have a minimum number of such instrumentations at each specified dam, and installed in such manner as may be specified by the regulations for monitoring the performance of such dam.

v. Installation of Seismological Station - As per Section 34(1) of Dam Safety Act, in the case of every specified dam, having a height of thirty metres or above or falling under such seismic zone, as may be specified by the regulations, the owner of the specified dam shall establish a seismological station in the vicinity of each such dam for recording micro and strong motion earthquakes and such other data as may be specified by the regulations.

vi. Risk Assessment - As per Section 35(2) of Dam Safety Act, every owner of a specified dam, for each of its dam shall, carry out risk assessment studies at such interval as may be specified by the regulations and the first such study shall be made within five years from the date of commencement of this Act i.e. by December, 2026.

vii. Emergency Action Plan - As per Section 36 of Dam Safety Act, every owner of a specified dam has to prepare emergency action plan before allowing the initial filling of the reservoir. In respect of the dam which is constructed and filled before the commencement of the Act, emergency action plan has to be prepared within five years from the date of commencement of the Act and thereafter update such plans at regular intervals as may be specified by the regulations.

viii. Comprehensive Dam Safety Evaluation - As per Section 38(1) of Dam Safety Act, the owner of a specified dam shall make or cause to be made comprehensive dam safety evaluation of each specified dam through an independent panel of experts constituted as per regulations for the purpose of determining the conditions of the specified dam and its reservoir:

(i) Provided that the first comprehensive dam safety evaluation for each existing specified dam shall be conducted within five years from the date of commencement of this Act, and thereafter the comprehensive dam safety evaluation of each such dam shall be carried out at regular intervals as may be specified by the regulations.

(ii) As per Section 38(2) of Dam Safety Act, the comprehensive dam safety evaluation shall consist of, but not be limited to -

a) Review and analysis of available data on the design, construction, operation, maintenance and performance of the structure;

b) General assessment of hydrologic and hydraulic conditions with mandatory review of design floods as specified by the regulations;

c) General assessment of seismic safety of specified dam with mandatory site-specific seismic parameters study in certain cases as specified by the regulations;

d) Evaluation of the operation, maintenance and inspection procedures; and
e) Evaluation of any other conditions which constitute a hazard to the integrity of the structure.

(iii) As per Section 39 of Dam Safety Act, the comprehensive dam safety evaluation shall be compulsory in the case of-
a) Major modification to the original structure or design criteria;
b) Discovery of an unusual condition at the dam or reservoir rim; and
c) An extreme hydrological or seismic event.

(iv) Safety measures in respect of dams other than specified dams – As per Section 46 of Dam Safety Act, every owner of the dam other than specified dams shall undertake such measures as may be necessary to ensure dam safety and shall comply with such measures as may be specified by the regulations.

(v) States and Union having powers to take punitive action on consistent failures on the part of the dam owner

### 2.4.3 Dam Rehabilitation and Improvement Project (DRIP)

In April 2012, Ministry of Jal Shakti initiated World Bank supported Dam Rehabilitation and Improvement Project (DRIP) with an objective to improve safety and operational performance of selected dams, along with institutional strengthening with system wide management approach. The Scheme has provision to rehabilitate 223 dams, located in 7 States Jharkhand, Karnataka, Kerala, Madhya Pradesh, Odisha, Tamil Nadu and Uttarakhand with budget outlay of Rs. 3466 Cr. Phase1 of the project got completed on 31$^{st}$ March, 2021. The completion cost of the Scheme is Rs. 2567 Cr.

#### 2.4.3.1 Scheme Outcome

i. Physical rehabilitation of 223 dams to address various safety concerns of dams, safety of downstream people, property, environment and ecology of river.

ii. The Emergency Action Plan (EAP) of 217 dams were prepared and 103 stakeholder consultations by various Implementing Agencies were conducted for dissemination of EAPs.

iii. Operation and Maintenance Manuals of 221 dams were prepared.

iv. 13 nos. of new Guidelines and Manuals published on various aspects of dam safety.

v. Capacity building of 8 Academic Institutions and 2 Central Agencies in addition to 10 Project Agencies.

vi. 191 nos. of training programs conducted, wherein about 5500 officials trained.

vii. Dam Health and Rehabilitation Monitoring Application (DHARMA), a web-based asset management tool developed to support the effective collection and management of dam data.

#### 2.4.3.2 Impacts

i. The Scheme has been able to develop two most important technical documents (EAP, O&M manual) for all dams under DRIP scheme which will ensure safety and operational performance of selected dams; will mitigate the associated risks with dam failure through stakeholders' sensitization about consequences, contribute in making more disaster resilience society.

ii. Capacity building of all partners will ensure availability of trained manpower to ensure safe dam operations.

iii. Participating States given opportunity to take up need based de-siltation activities of reservoirs.

iv. A step forward by India to act as a knowledge hub and lead in dam safety management.

v. Academic institutions have been taken on board for long term capacity building to meet the future challenges of dam safety management.

vi. IISc Bangalore and IIT Roorkee have started Post Graduate Degree Programmes in Dam
   a) Engineering w.e.f. Academic Session 2021.

vii. DRIP has prepared dam owners of India to carry out the technical activities like safety inspections, investigations, rehabilitation, instrumentation, risk assessment etc. and to ensure institutional setup as proposed under Dam Safety Bill.

### 2.4.4 Dam Rehabilitation and Improvement Project Phase-II and III

Based on the success of DRIP Phase-I, the Ministry of Jal Shakti initiated activities for DRIP Phase II and Phase III, by inviting proposals in year 2017 for inclusion of a greater number of States for rehabilitation of dams facing serious health and dam safety challenges. It is a State Sector Scheme with financial outlay of Rs. 10,211 Cr (US$ 1.5 Billion), with duration of 10 years, to be implemented in two Phases i.e. Phase-II and Phase-III, each of six years duration with an overlap of two years. The Scheme has four components;

i. Based on the success of DRIP Phase-I, the Ministry of Jal Shakti initiated activities for DRIP Phase II and Phase III, by inviting proposals in year 2017 for inclusion of more number of States for rehabilitation of dams facing serious health and dam safety challenges. It is a State Sector Scheme with financial outlay of Rs. 10,211 Cr (US$ 1.5 Billion), with duration of 10 years, to be implemented in two Phases i.e. Phase-II and Phase-III, each of six years duration with an overlap of two years.

ii. The Scheme has four components;
   (i) Rehabilitation of dams and associated appurtenances to improve the safety and operational performance of selected existing dams and associated appurtenances in a sustainable manner,
   (ii) Dam safety Institutional Strengthening to strengthen the dam safety institutional setup in participating States as well as on a Central level,
   (iii) Incidental Revenue Generation for sustainable operation and maintenance of dams and
   (iv) Project Management.

iii. EFC for DRIP Phase-II and Phase-III was approved on 26th May, 2020 and the Union Cabinet approved the Scheme on 29th October, 2020. The funding pattern of Scheme is 80:20 (Special Category States), 70:30 (General Category States) and 50:50 (Central Agencies). The Scheme also has provision of Central Grant of 90% of loan amount for special category States (Manipur, Meghalaya and Uttarakhand).

iv. The Phase II of the Scheme is being co-financed by two multi-lateral funding Agencies - World Bank and Asian Infrastructure Investment Bank (AIIB), with funding of US$ 250 million each. The Loan Signing with World Bank (US$ 250 M) was held in August, 2021 in which 10 States (Gujarat, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Rajasthan, Odisha, Tamil Nadu, Chhattisgarh) participated. The Phase II has been declared effective by the World Bank in October, 2021. Loan Negotiations for another US$ 250 million with AIIB held on February 17, 2022.

v. Objective of the Project: The project development objectives of DRIP Phase-II & Phase-III are:
   (i) To improve the safety and performance of selected existing dams and associated appurtenances in a sustainable manner,
   (ii) To strengthen the dam safety institutional setup in participating States as well as at Central level, and
   (iii) To explore the alternative incidental means at a few of selected dams to generate the incidental revenue for sustainable operation and maintenance of dams

vi. Scheme Progress: The preparatory activities including Design Flood Review, Inspection by Dam Safety Review Panel, preparation of Project Screening Template and its approval by World Bank, publication of tenders and its award, etc. are already in full swing. So far, DFR of 326 dams, Inspection by DSRP of 301 dams, PST for 189 dams with total estimated cost of Rs 5325 Cr have been prepared. The tenders amounting to Rs. 2150 Cr has been published. The contract(s) for Rs 1077 Cr have been awarded. The cumulative expenditure up to March, 2022 is Rs. 246 Cr.

### 2.4.5 Drip Activities

i. DEA-AIIB Tripartite Portfolio Review Meeting (TPRM), May 25, 2021. The meeting was held to review the readiness of partner States of DRIP Phase II to negotiate the loan with AIIB. The meeting was attended by representatives of DEA, AIIB, Ministry of Jal Shakti and CWC.

ii. Meeting to Review the Progress of Partner Agencies of DRIP Phase II and Phase III. Joint Meetings to review the progress of the agencies of DRIP Phase II were held with Rajasthan WRD, UJVNL, Manipur WRD, Meghalaya Power Generation Corporation Limited (MePGCL), Kerala WRD, KSEB and Gujarat NWR, WS & KD during the month of June, 2021.

iii. Loan signing ceremony for DRIP Phase II with World Bank for loan amounting US $ 250 Million was held on August 04, 2021. Loan Agreement was signed by DEA and World Bank and Project Agreement was signed by 10 partner States (Gujarat, Manipur, Meghalaya, Chhattisgarh, Madhya Pradesh, Rajasthan, Odisha, Kerala, Maharashtra and Tamil Nadu) with World Bank.

iv. Stakeholder Consultation Meeting for the implementation of published EAP for Hidkal dam of Karnataka WRD on August 19, 2021.

v. Joint Review meeting with Karnataka WRD, August 26-27, 2021: A Joint Meeting was held on August 26, 2021 at Bengaluru, Karnataka to review the Project Readiness Criteria of Karnataka WRD for DRIP Phase II, followed by a field visit to KRS dam for inspecting the works being carried under DRIP. The central team was headed by Smt. Debashree Mukherjee, Additional Secretary, D/o Water Resources, RD & GR and Karnataka was represented by Sh. Rakesh Singh, Additional Chief Secretary, WRD, Govt. of Karnataka.

vi. As a part of Dam Safety Institutional Strengthening component of DRIP Phase II, Central Project Management Unit (CPMU) organised 2-day training cum workshop programme on 'Procurement Management under DRIP-2' in two batches for 17 States during September 20-21 and 27-28, 2021. CPMU and World Bank experts delivered lectures on various aspects of procurement covering various topics inter-alia Procurement Regulations of World Bank, Project Procurement Strategy for Development (PPSD), Procurement Management Manual, Standard Bidding Document and its important provisions, Technical Specifications, DRIP Phase I experience and challenges. The programme combined lectures, case studies and interactive sessions.

vii. Training Cum Workshop on Environmental and Social Safeguards was organised by CPMU for DRIP Phase II Implementing Agencies in three batches during September 24-25, October 11-12 and October 4-5, 2021. The workshop saw an active participation of almost 470 participants from various states. The programme combined lectures, case studies and interactive sessions.

viii. Training Cum Workshop on Financial Management was organised by CPMU for DRIP Phase II Implementing Agencies in two batches on October 25, 2021 and November 01, 2021. The workshop saw an active participation of almost 250 participants from various states.

ix. Training on "Operation and Maintenance aspects regarding Hydro-Mechanical and Control System Issues in Dams" was organized by CPMU in collaboration with Hydro Exploitation SA, Switzerland during November 22-26, 2021 at New Delhi. The training comprised of lectures, hands on trainings, case studies, field visit to Narora barrage of Uttar Pradesh and interactive sessions. The training was attended by officials from CWC, World Bank, State of Rajasthan, Karnataka, Manipur and Meghalaya.

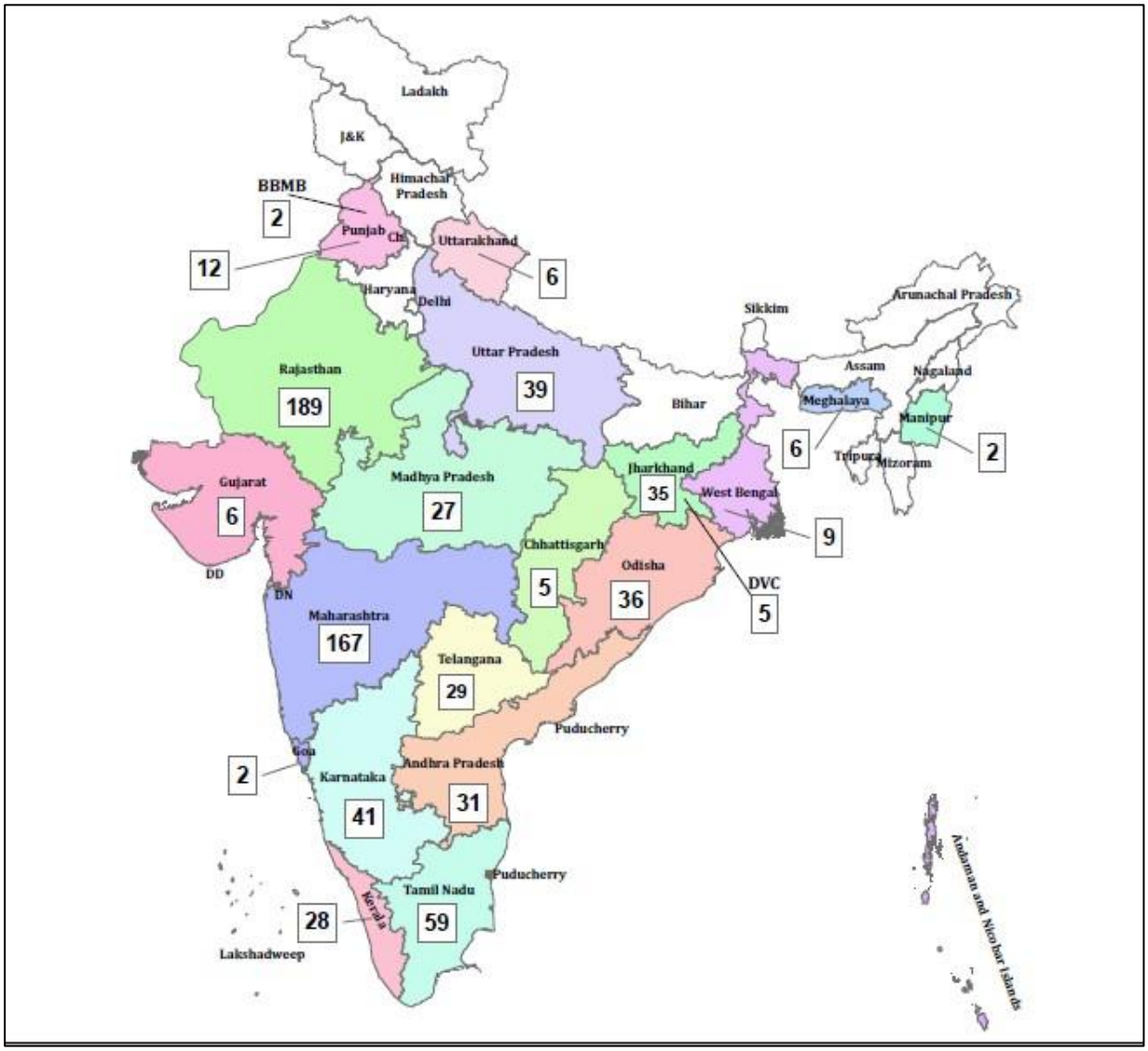
x. World Bank Review Mission for DRIP Phase II was held in hybrid mode with eleven (11) Implementing Agencies during November 30-December 21, 2021, followed by a Wrap-up meeting on December 22, 2021 at New Delhi under the Chairmanship of Smt. Debashree Mukherjee, Additional Secretary, D/o WR, RD &GR.

### 2.4.6 Training on 'Operation and Maintenance aspects regarding Hydro-Mechanical and Control System Issues in Dams'

i. A Loan Negotiation Meeting was held on February 17, 2022 for the loan of US $ 250 Million from Asian Infrastructure Investment Bank (AIIB) for co-financing DRIP Phase II. The meeting was attended by representatives of the AIIB, World Bank, DEA, Ministry of Jal Shakti, CWC, the State of Chhattisgarh, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, and Tamil Nadu. All-important terms and conditions of loan were deliberated and other documents were negotiated and finalised.

ii. Construction Supervision and Quality Assurance (CS&QA) visit was carried out during March 25-26, 2022, to inspect the rehabilitation activities carried out under DRIP Phase II at Kuttiyadi dam and Karapuzha dam. Recommendations were given by the CWC team on quality control and various bottlenecks of the project. The Inspection visit was undertaken by the CWC officials led by Chief Engineer, DSO along with officials from Kerala WRD, Independent Experts and representatives of concerned contractor.

**Map 3: DRIP Phase II & Phase III Coverage across India**




Source: Dam Safety (REHL) Directorate, Central Water Commission, M/o Jal Shakti

**Table 2.14: Abstract of Large Dams**

| Sl. No. | States/UTs | Total Completed Dams | Under Construction Dams | Total Dams |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | Andaman & Nicobar Islands* | 2 | | 2 |
| 2 | Andhra Pradesh | 149 | 17 | 166 |
| 3 | Arunachal Pradesh | 1 | 3 | 4 |
| 4 | Assam | 3 | 1 | 4 |
| 5 | Bihar | 24 | 2 | 26 |
| 6 | Chhattisgarh | 249 | 9 | 258 |
| 7 | Goa | 5 | 0 | 5 |
| 8 | Gujarat | 620 | 12 | 632 |
| 9 | Himachal Pradesh | 19 | 1 | 20 |
| 10 | Haryana | 1 | 0 | 1 |
| 11 | Jammu & Kashmir* | 15 | 2 | 17 |
| 12 | Jharkhand | 55 | 24 | 79 |
| 13 | Karnataka | 230 | 2 | 232 |
| 14 | Kerala | 61 | 0 | 61 |
| 15 | Madhya Pradesh | 899 | 7 | 906 |
| 16 | Maharashtra | 2117 | 277 | 2394 |
| 17 | Manipur | 3 | 1 | 4 |
| 18 | Meghalaya | 8 | 2 | 10 |
| 19 | Mizoram | 1 | 0 | 1 |
| 20 | Nagaland | 1 | 0 | 1 |
| 21 | Odisha | 200 | 4 | 204 |
| 22 | Punjab | 14 | 2 | 16 |
| 23 | Rajasthan | 204 | 8 | 212 |
| 24 | Sikkim | 2 | 0 | 2 |
| 25 | Tamil Nadu | 118 | 0 | 118 |
| 26 | Telangana | 168 | 16 | 184 |
| 27 | Tripura | 1 | 0 | 1 |
| 28 | Uttar Pradesh | 117 | 13 | 130 |
| 29 | Uttarakhand | 17 | 8 | 25 |
| 30 | West Bengal | 30 | 0 | 30 |
| **Grand Total** | | **5334** | **411** | **5745** |

Source: Dam Safety Monitoring Directorate, CWC/NRLD-2019 Published on 27.06.2019 (as per the latest availability of data)

Note: '*': Union Territory

International Commission on Large Dams (ICOLD) Specification;

A large dam is classified as one with a maximum height of more than 15 m from its deepest foundation to the crest. A dam between 10 & 15 m in height from its deepest foundation is also included in the classification of a large dam provided it complies with one of the following conditions:

a) the length of crest of the dam is not less than 500 m or

b) the capacity of the reservoir formed by the dam is not less than one MCM or

c) the maximum flood discharge dealt with by the dam is not less than 2000 cubic metres per second or d) the dam has specially difficult foundation problems or

e) the dam is of unusual design

**Table 2.15: State-wise Live Storage Capacity of Reservoirs**

| Sl. No. | States/UTs | Total Live Storage Capacity (BCM) |
|---|---|---|
| 1 | 2 | 3 |
| 1 | Andaman & Nicobar Islands | 0.019 |
| 2 | Arunachal Pradesh | 0.000 |
| 3 | Andhra Pradesh (Erstwhile) | 28.716 |
| 4 | Assam | 0.012 |
| 5 | Bihar | 2.613 |
| 6 | Chhattisgarh | 6.736 |
| 7 | Goa | 0.290 |
| 8 | Gujarat | 22.553 |
| 9 | Himachal Pradesh | 13.792 |
| 10 | Jammu & Kashmir | 0.029 |
| 11 | Jharkhand | 2.436 |
| 12 | Karnataka | 31.903 |
| 13 | Kerala | 9.768 |
| 14 | Maharashtra | 37.358 |
| 15 | Madhya Pradesh | 33.075 |
| 16 | Manipur | 0.532 |
| 17 | Meghalaya | 0.479 |
| 18 | Nagaland | 1.220 |
| 19 | Odisha | 24.032 |
| 20 | Punjab | 2.402 |
| 21 | Rajasthan | 9.708 |
| 22 | Sikkim | 0.007 |
| 23 | Tamil Nadu | 7.859 |
| 24 | Tripura | 0.312 |
| 25 | Uttarakhand | 5.670 |
| 26 | Uttar Pradesh | 14.263 |
| 27 | West Bengal | 2.027 |
| 28 | Mizoram | 0.000 |
| **Total** | | **257.812** |

Source: Water Management Directorate, Central Water Commission, M/o Jal Shakti.

Note: Reconciliation of Live Storage Capacities of Reservoirs is under process.
The above figures are as furnished/made available to CWC as on 01.12.2017 (as per the latest availability of data).

## Table 2.16: Basin-wise Live Storage Capacity of Reservoirs

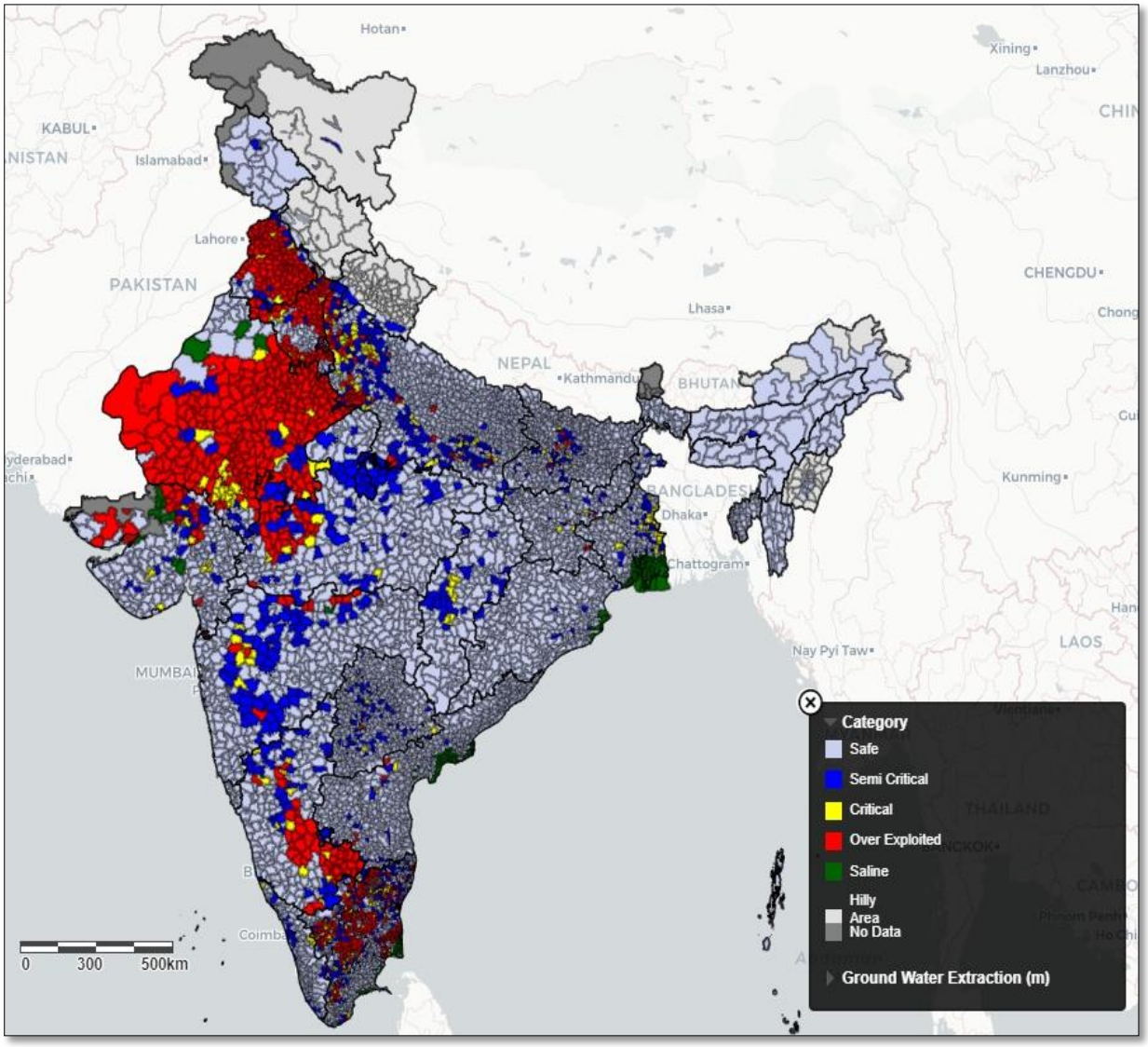
| Sl. No. | Basin Name | Live Storage (in BCM) | | |
|---|---|---|---|---|
| | | Completed Projects | Under Construction Projects | Total |
| 1 | 2 | 3 | 4 | 5 |
| 1 | Indus | 16.223 | 0.100 | 16.323 |
| 2 | Ganga | 48.677 | 7.649 | 56.326 |
| 3 | Brahmaputra | 1.718 | 0.795 | 2.513 |
| 4 | Barak & others | 0.719 | 9.172 | 9.891 |
| 5 | Godavari | 35.040 | 8.412 | 43.452 |
| 6 | Krishna | 50.651 | 4.156 | 54.807 |
| 7 | Cauvery | 9.083 | 0.015 | 9.098 |
| 8 | Subernarekha | 0.309 | 2.150 | 2.459 |
| 9 | Brahmani & Baitarni | 5.554 | 0.703 | 6.257 |
| 10 | Mahanadi | 13.066 | 1.461 | 14.527 |
| 11 | Pennar | 2.938 | 2.141 | 5.079 |
| 12 | Mahi | 5.017 | 0.150 | 5.167 |
| 13 | Sabarmati | 1.577 | 0.109 | 1.686 |
| 14 | Narmada | 21.816 | 2.641 | 24.457 |
| 15 | Tapi | 9.137 | 1.558 | 10.695 |
| 16 | West Flowing Rivers (WFR) from Tapi to Tadri | 14.668 | 2.430 | 17.098 |
| 17 | West Flowing Rivers (WFR) from Tadri to Kanyakumari | 11.023 | 1.416 | 12.439 |
| 18 | East Flowing Rivers (EFR) between Mahanadi and Pennar | 2.676 | 1.181 | 3.857 |
| 19 | East Flowing Rivers (EFR) between Pennar and Kanyakumari | 1.441 | 0.015 | 1.456 |
| 20 | West Flowing Rivers (WFR) of Saurashtra and Kutch including Luni | 6.336 | 0.511 | 6.847 |
| 21 | Area of Inland drainage of Rajasthan | 0.000 | 0.000 | 0.000 |
| 22 | Minor Rivers draining into Myanmar and Bangladesh | 0.144 | 0.000 | 0.144 |
| 23 | Area of North Ladakh not draining into Indus | 0.000 | 0.000 | 0.000 |
| **Total** | | **257.812** | **46.765** | **304.577** |

Source: WM Directorate, Central Water Commission, M/o Jal Shakti.

Note-1: Reconciliation of Live Storage Capacities of Reservoirs is under process. The above figures are furnished/ made available to CWC as on 01.12.2017 (as per the latest availability of data).
Note-2: Totals may not tally due to rounding off.

.

**Map 4: Categorization of Assessment Units as per Dynamic Ground Water Resources Assessment of India- 2022**




Source: Central Ground Water Board, D/o Water Resources, RD & GR, M/o Jal Shakti (https://cgwb.gov.in/sites/default/files/inline-files/2022-11-11-gwra_2022_1_compressed.pdf)

Note:

1. Based on the stage of extraction, the assessment units are categorized as Safe (<= 70%); Semi-Critical (>70 % and <=90 %); Critical (>90% and <=100%) and Over-Exploited (>100 %).

2. The percentage of Over-exploited and Critical administrative units more than 25% of the total units are in Delhi, Haryana, Karnataka, Punjab, Rajasthan, Tamil Nadu, Dadra & Nagar Haveli and Daman & Diu.

3. The overall stage of groundwater extraction in the country is 60.08%. The stage of ground water extraction is very high in the States/UTs of Haryana, Punjab, Rajasthan, Dadra & Nagar Haveli and Daman & Diu where it is more than 100%, which implies that in these States/UTs the annual ground water consumption is more than annual extractable ground water resources. In the States of Delhi, Tamil Nadu, Uttar Pradesh, Karnataka and UTs of Chandigarh, Lakshadweep and Puducherry, the stage of ground water extraction is between 60-100%. In rest of the States/UTs, the stage of ground water extraction is below 60%.

**Table 2.17: State/UT-wise Categorization of Assessment Units in India, 2022**

| Sl. No. | States/UTs | Total No. of Assessed Units | Safe | | Semi-Critical | | Critical | | Over-Exploited | | Saline | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Nos. | % | Nos. | % | Nos. | % | Nos. | % | Nos. | % |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **States** | | | | | | | | | | | | |
| 1 | Andhra Pradesh | 667 | 598 | 89.70 | 19 | 2.80 | 5 | 0.70 | 6 | 0.90 | 39 | 5.85 |
| 2 | Arunachal Pradesh | 11 | 11 | 100.00 | - | - | - | - | - | - | - | - |
| 3 | Assam | 28 | 27 | 96.43 | 1 | 3.57 | - | - | - | - | - | - |
| 4 | Bihar | 535 | 469 | 87.66 | 46 | 8.60 | 12 | 2.24 | 8 | 1.50 | - | - |
| 5 | Chhattisgarh | 146 | 116 | 79.45 | 24 | 16.44 | 6 | 4.11 | - | - | - | - |
| 6 | Delhi | 34 | 4 | 11.76 | 8 | 23.53 | 7 | 20.59 | 15 | 44.12 | - | - |
| 7 | Goa | 12 | 12 | 100.00 | - | - | - | - | - | - | - | - |
| 8 | Gujarat | 252 | 189 | 75.00 | 20 | 7.94 | 7 | 2.78 | 23 | 9.13 | 13 | 5.16 |
| 9 | Haryana | 143 | 36 | 25.17 | 9 | 6.29 | 10 | 6.99 | 88 | 61.54 | - | - |
| 10 | Himachal Pradesh | 10 | 10 | 100.00 | - | - | - | - | - | - | - | - |
| 11 | Jharkhand | 263 | 241 | 91.63 | 11 | 4.18 | 6 | 2.28 | 5 | 1.90 | - | - |
| 12 | Karnataka | 234 | 139 | 59.40 | 35 | 14.96 | 11 | 4.70 | 49 | 20.94 | - | - |
| 13 | Kerala | 152 | 122 | 80.26 | 27 | 17.76 | 3 | 1.97 | - | - | - | - |
| 14 | Madhya Pradesh | 317 | 226 | 71.29 | 60 | 18.93 | 5 | 1.58 | 26 | 8.20 | - | - |
| 15 | Maharashtra | 353 | 272 | 77.05 | 62 | 17.56 | 7 | 1.98 | 11 | 3.12 | 1 | 0.28 |
| 16 | Manipur | 9 | 9 | 100.00 | - | - | - | - | - | - | - | - |
| 17 | Meghalaya | 12 | 12 | 100.00 | - | - | - | - | - | - | - | - |
| 18 | Mizoram | 26 | 26 | 100.00 | - | - | - | - | - | - | - | - |
| 19 | Nagaland | 11 | 11 | 100.00 | - | - | - | - | - | - | - | - |
| 20 | Odisha | 314 | 300 | 95.54 | 8 | 2.55 | - | - | - | - | 6 | 1.91 |
| 21 | Punjab | 153 | 17 | 11.11 | 15 | 9.80 | 4 | 2.61 | 117 | 76.47 | - | - |
| 22 | Rajasthan | 302 | 38 | 12.58 | 20 | 6.62 | 22 | 7.28 | 219 | 72.52 | 3 | 0.99 |
| 23 | Sikkim | 6 | 6 | 100.00 | - | - | - | - | - | - | - | - |
| 24 | Tamil Nadu | 1166 | 463 | 39.71 | 231 | 19.81 | 78 | 6.69 | 360 | 30.87 | 34 | 2.92 |
| 25 | Telangana | 594 | 494 | 83.00 | 80 | 13.60 | 7 | 1.20 | 13 | 2.20 | - | - |
| 26 | Tripura | 59 | 59 | 100.00 | - | - | - | - | - | - | - | - |
| 27 | Uttar Pradesh | 836 | 557 | 66.63 | 169 | 20.22 | 47 | 5.62 | 63 | 7.54 | - | - |
| 28 | Uttarakhand | 18 | 14 | 77.78 | 4 | 22.22 | - | - | - | - | - | - |
| 29 | West Bengal | 345 | 232 | 67.25 | 31 | 8.99 | 22 | 6.38 | - | - | 60 | 17.39 |

**Contd…**

**Table 2.17: State/UT-wise Categorization of Assessment Units in India, 2022**

| Sl. No. | States/UTs | Total No. of Assessed Units | Safe | | Semi-Critical | | Critical | | Over-Exploited | | Saline | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Nos. | % | Nos. | % | Nos. | % | Nos. | % | Nos. | % |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **UTs** | | | | | | | | | | | | |
| 30 | Andaman and Nicobar | 36 | 35 | 97.22 | - | - | - | - | - | - | 1 | 2.78 |
| 31 | Chandigarh | 1 | - | - | 1 | 100.00 | - | - | - | - | - | - |
| 32 | Dadra & Nagar Haveli | 1 | - | - | - | - | - | - | 1 | 100.00 | - | - |
| 33 | Daman & Diu | 2 | - | - | - | - | - | - | 2 | 100.00 | - | - |
| 34 | Jammu & Kashmir | 20 | 19 | 95.00 | 1 | 5.00 | - | - | - | - | - | - |
| 35 | Ladakh | 8 | 7 | 87.50 | 1 | 12.50 | - | - | - | - | - | - |
| 36 | Lakshadweep | 9 | 7 | 77.78 | 2 | 22.22 | - | - | - | - | - | - |
| 37 | Puducherry | 4 | 2 | 50.00 | - | - | 1 | 25.00 | - | - | 1 | 25.00 |
| **Grand Total** | | **7089** | **4780** | **67.43** | **885** | **12.48** | **260** | **3.67** | **1006** | **14.19** | **158** | **2.23** |

Source: Central Ground Water Board, D/o Water Resources, RD & GR, M/o Jal Shakti

Note 1:

'Blocks': Bihar, Chhattisgarh, Haryana, Jharkhand, Kerala, Madhya Pradesh, Manipur, Mizoram, Odisha, Punjab, Rajasthan, Tripura, Uttar Pradesh, Uttarakhand, West Bengal;

'Taluks': Goa, Gujarat, Karnataka, Maharashtra;

'Mandals': Andhra Pradesh, Telangana;

'District': Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim, Dadra & Nagar Haveli, Daman & Diu, Jammu & Kashmir;

'Valley': Himachal Pradesh, Ladakh;

'Islands': Andaman & Nicobar and Lakshadweep;

'Firka': Tamil Nadu;

'Region': Puducherry;

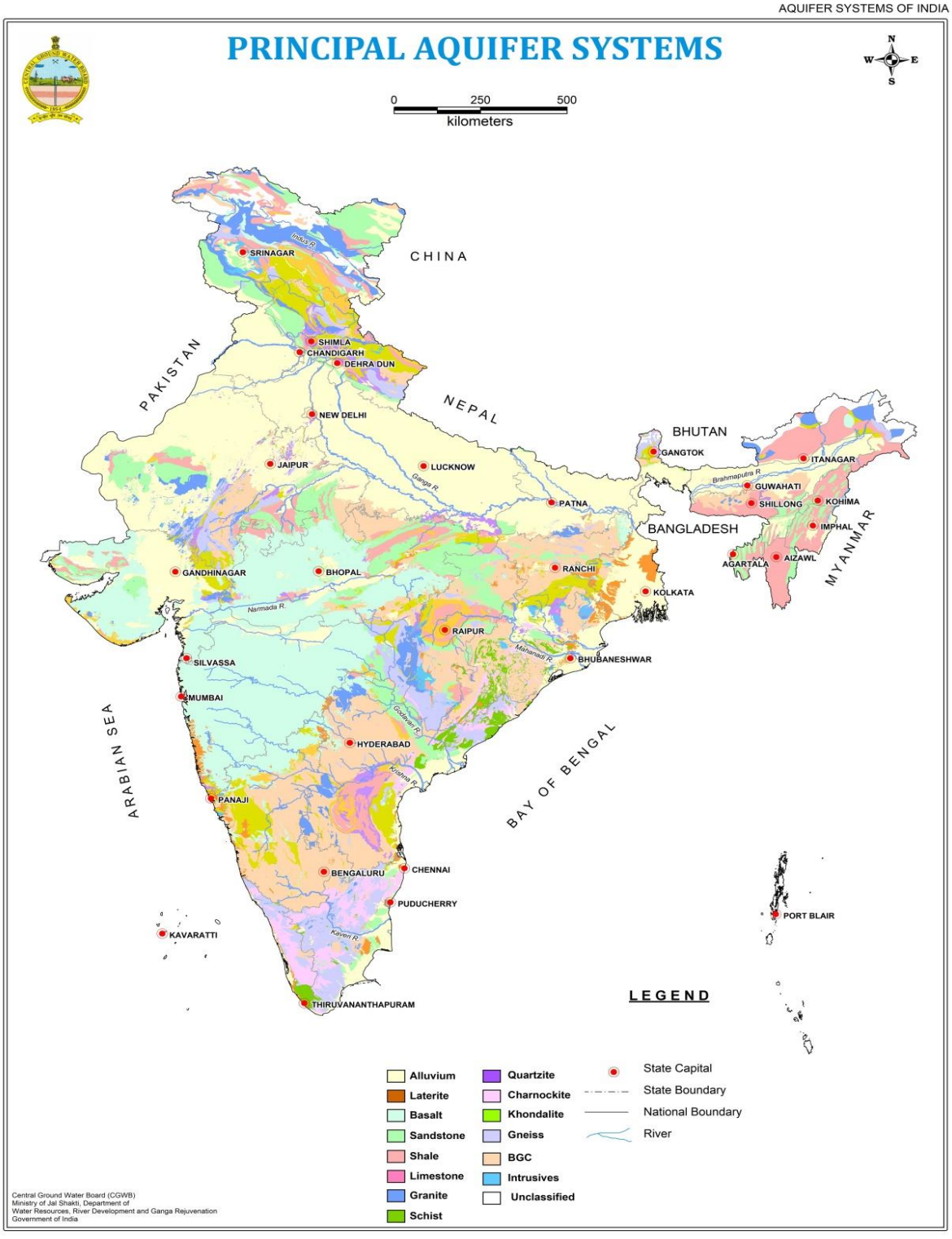
'UT': Chandigarh;

'Tehsil': Delhi.

Note 2:

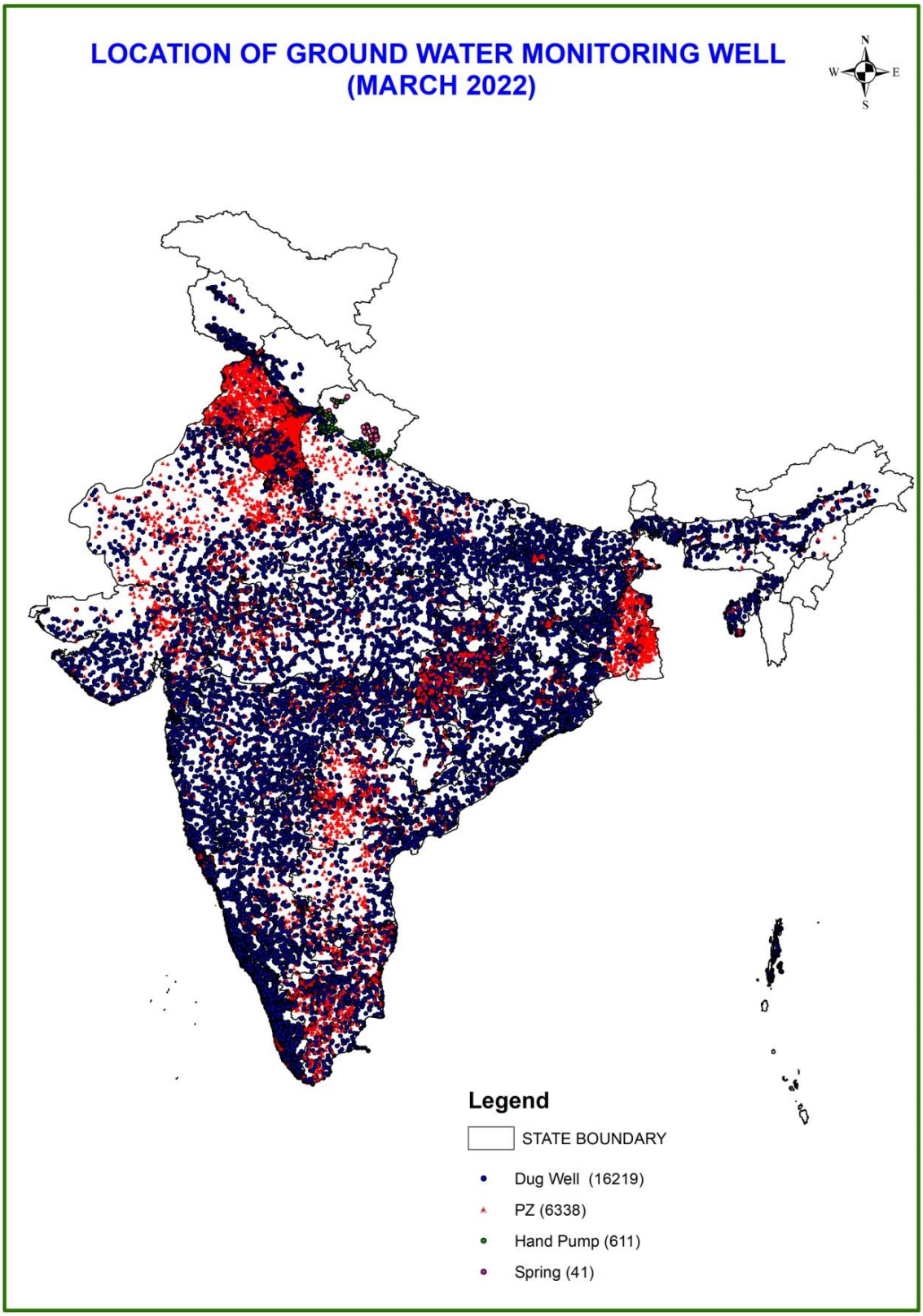
Based on the stage of extraction, the assessment units are categorized as Safe (<= 70%); Semi-Critical (>70 % and <=90 %); Critical (>90% and <=100%) and Over-Exploited (>100 %).

**Map 5: Principal Aquifer System of India**




Source: Central Ground Water Board, D/o Water Resources, RD & GR, M/o Jal Shakti

**Map 6: Ground Water Monitoring Stations in India**




Source: Central Ground Water Board, D/o WR, RD & GR, M/o Jal Shakti

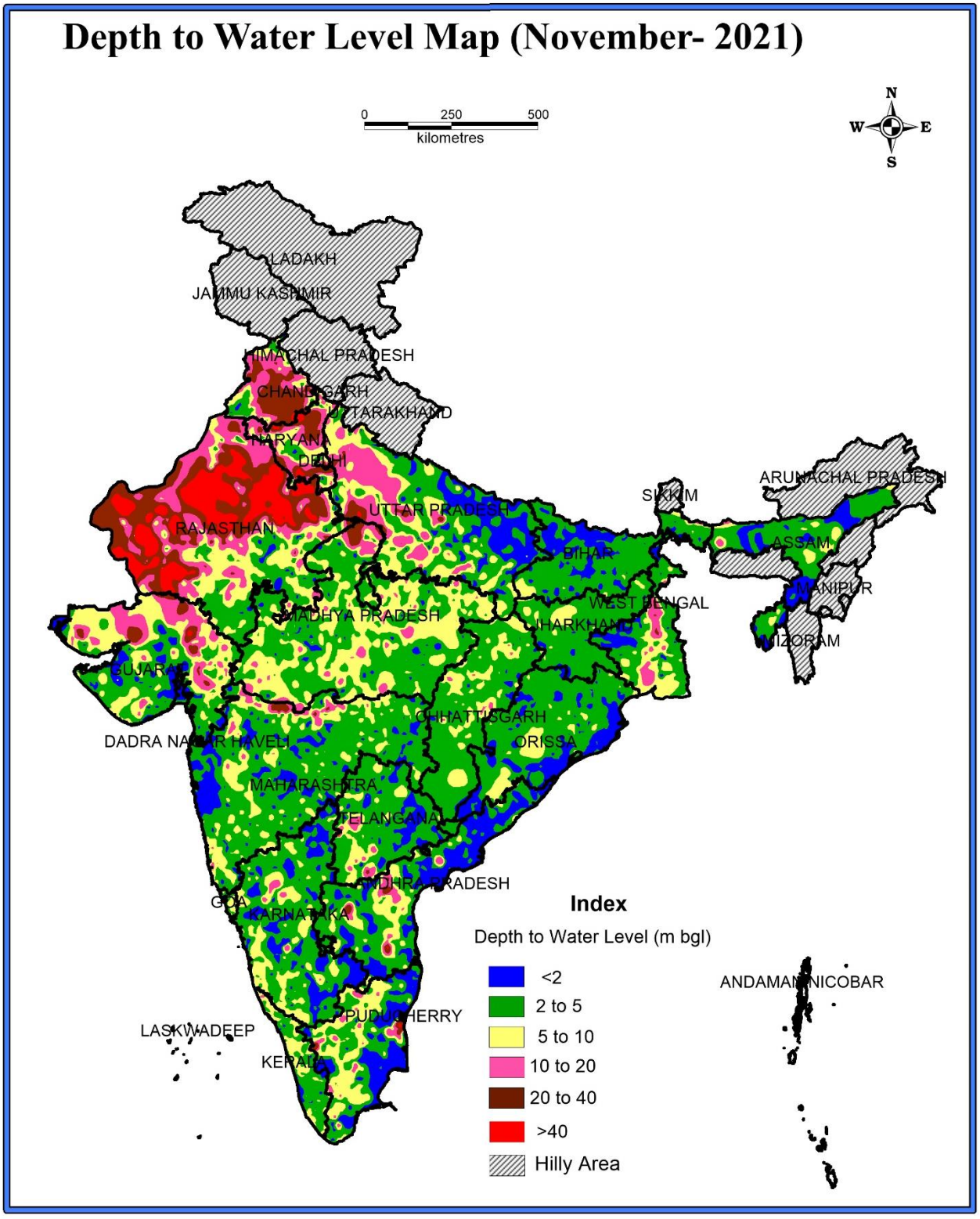
**Table 2.18: State/UT-wise Ground Water Monitoring Wells in India**

| Sl. No. | Name of the States/UTs | Number of GW Monitoring Wells (March, 2022) |
|---|---|---|
| 1 | 2 | 3 |
| **States** | | |
| 1 | Andhra Pradesh | 972 |
| 2 | Arunachal Pradesh | 30 |
| 3 | Assam | 414 |
| 4 | Bihar | 750 |
| 5 | Chhattisgarh | 1295 |
| 6 | Delhi | 129 |
| 7 | Goa | 132 |
| 8 | Gujarat | 1100 |
| 9 | Haryana | 538 |
| 10 | Himachal Pradesh | 140 |
| 11 | Jammu & Kashmir | 301 |
| 12 | Jharkhand | 452 |
| 13 | Karnataka | 1675 |
| 14 | Kerala | 1591 |
| 15 | Madhya Pradesh | 1482 |
| 16 | Maharashtra | 1923 |
| 17 | Manipur | 0 |
| 18 | Meghalaya | 70 |
| 19 | Nagaland | 30 |
| 20 | Odisha | 1623 |
| 21 | Punjab | 488 |
| 22 | Rajasthan | 1266 |
| 23 | Tamil Nadu | 1379 |
| 24 | Telangana | 885 |
| 25 | Tripura | 115 |
| 26 | Uttar Pradesh | 1007 |
| 27 | Uttarakhand | 217 |
| 28 | West Bengal | 1568 |
| **Union Territories** | | |
| 1 | Andaman & Nicobar Islands | 113 |
| 2 | Chandigarh | 26 |
| 3 | Dadra & Nagar Haveli | 17 |
| 4 | Daman & Diu | 24 |
| 5 | Puducherry | 16 |
| **Total Ground Water Monitoring Wells** | | **23209** |

Source: Central Ground Water Board, D/o Water Resources, RD & GR, M/o Jal Shakti

**Map 7: Water Level Scenario in India**

**Depth to Water Level Map of Post Monsoon (November), 2021**




Source: Central Ground Water Board, D/o WR, RD & GR, M/o Jal Shakti

## Table 2.19: State-wise Ground Water Resources in India, 2022

(in BCM)

| Sl. No. | States/ Union Territories | Ground Water Recharge | | | | | Total Natural Discharges | Annual Extractable Ground Water Resource | Current Annual Ground Water Extraction | | | | Annual GW Allocation for Domestic use as on 2025 | Net Ground Water Availability for Future use | Stage of Ground Water Extraction (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monsoon Season | | Non-monsoon Season | | Total Annual Ground Water Recharge | | | Irrigation | Industrial | Domestic | Total | | | |
| | | Recharge from Rainfall | Recharge from other Sources | Recharge from Rainfall | Recharge from other Sources | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 1 | Andhra Pradesh | 9.14 | 9.41 | 0.91 | 7.77 | 27.23 | 1.36 | 25.86 | 6.46 | 0.16 | 0.83 | 7.45 | 1.09 | 18.54 | 28.81 |
| 2 | Arunachal Pradesh | 1.96 | 0.94 | 1.06 | 0.56 | 4.52 | 0.41 | 4.07 | 0.02 | 0.01 | 0.01 | 0.03 | 0.01 | 4.03 | 0.79 |
| 3 | Assam | 17.92 | 1.15 | 6.52 | 0.94 | 26.53 | 2.56 | 21.40 | 2.06 | 0.01 | 0.58 | 2.65 | 0.62 | 18.71 | 12.38 |
| 4 | Bihar | 19.94 | 7.07 | 1.14 | 5.00 | 33.15 | 3.10 | 30.04 | 10.01 | 0.35 | 3.14 | 13.50 | 3.41 | 16.76 | 44.94 |
| 5 | Chhattisgarh | 8.08 | 1.80 | 0.15 | 2.01 | 12.04 | 1.04 | 11.01 | 4.62 | 0.11 | 0.73 | 5.46 | 0.83 | 5.56 | 49.58 |
| 6 | Delhi | 0.14 | 0.09 | 0.01 | 0.17 | 0.41 | 0.04 | 0.37 | 0.09 | 0.00 | 0.27 | 0.36 | 0.29 | 0.03 | 98.16 |
| 7 | Goa | 0.35 | 0.02 | 0.00 | 0.04 | 0.41 | 0.08 | 0.33 | 0.03 | 0.00 | 0.05 | 0.08 | 0.05 | 0.25 | 23.63 |
| 8 | Gujarat | 19.00 | 2.63 | 0.00 | 4.83 | 26.46 | 1.88 | 24.58 | 12.10 | 0.16 | 0.82 | 13.09 | 1.04 | 12.18 | 53.23 |
| 9 | Haryana | 3.15 | 2.79 | 0.70 | 2.83 | 9.48 | 0.87 | 8.61 | 10.30 | 0.60 | 0.65 | 11.54 | 0.66 | 1.04 | 134.14 |
| 10 | Himachal Pradesh | 0.60 | 0.14 | 0.14 | 0.15 | 1.03 | 0.09 | 0.94 | 0.18 | 0.05 | 0.12 | 0.35 | 0.12 | 0.59 | 37.56 |
| 11 | Jharkhand | 4.92 | 0.45 | 0.48 | 0.36 | 6.21 | 0.51 | 5.69 | 0.93 | 0.21 | 0.65 | 1.78 | 0.65 | 3.92 | 31.35 |
| 12 | Karnataka | 8.83 | 4.29 | 1.19 | 3.43 | 17.74 | 1.70 | 16.04 | 10.01 | 0.13 | 1.09 | 11.22 | 1.17 | 6.34 | 69.93 |
| 13 | Kerala | 4.25 | 0.15 | 0.47 | 0.87 | 5.74 | 0.54 | 5.19 | 1.17 | 0.01 | 1.55 | 2.73 | 2.20 | 2.18 | 52.56 |

Contd…

## Table 2.19: State-wise Ground Water Resources in India, 2022

(in BCM)

| Sl. No. | States/ Union Territories | Ground Water Recharge | | | | | Total Natural Discharges | Annual Extractable Ground Water Resource | Current Annual Ground Water Extraction | | | | Annual GW Allocation for Domestic use as on 2025 | Net Ground Water Availability for Future use | Stage of Ground Water Extraction (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monsoon Season | | Non-monsoon Season | | Total Annual Ground Water Recharge | | | Irrigation | Industrial | Domestic | Total | | | |
| | | Recharge from Rainfall | Recharge from other Sources | Recharge from Rainfall | Recharge from other Sources | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 14 | Madhya Pradesh | 26.87 | 1.56 | 0.11 | 6.69 | 35.23 | 2.66 | 32.58 | 17.39 | 0.17 | 1.69 | 19.25 | 1.88 | 14.21 | 59.10 |
| 15 | Maharashtra | 20.72 | 2.43 | 0.54 | 8.60 | 32.29 | 1.84 | 30.45 | 15.29 | 0.003 | 1.35 | 16.65 | 1.35 | 14.38 | 54.68 |
| 16 | Manipur | 0.40 | 0.00 | 0.11 | 0.01 | 0.52 | 0.05 | 0.47 | 0.02 | 0.00 | 0.02 | 0.04 | 0.02 | 0.43 | 7.95 |
| 17 | Meghalaya | 1.29 | 0.01 | 0.42 | 0.00 | 1.72 | 0.17 | 1.51 | 0.003 | 0.00 | 0.05 | 0.05 | 0.06 | 1.45 | 3.55 |
| 18 | Mizoram | 0.19 | 0.00 | 0.03 | 0.00 | 0.22 | 0.02 | 0.20 | 0.000 | 0.00 | 0.01 | 0.01 | 0.01 | 0.19 | 3.96 |
| 19 | Nagaland | 0.36 | 0.33 | 0.08 | 0.02 | 0.79 | 0.08 | 0.71 | 0.002 | 0.00 | 0.02 | 0.02 | 0.02 | 0.69 | 2.89 |
| 20 | Odisha | 10.44 | 2.82 | 1.81 | 2.72 | 17.79 | 1.44 | 16.34 | 5.83 | 0.16 | 1.24 | 7.23 | 1.37 | 9.03 | 44.25 |
| 21 | Punjab | 4.67 | 9.09 | 0.72 | 4.46 | 18.94 | 1.87 | 17.07 | 26.69 | 0.16 | 1.17 | 28.02 | 1.19 | 1.57 | 165.99 |
| 22 | Rajasthan | 8.71 | 0.62 | 0.20 | 2.61 | 12.13 | 1.17 | 10.96 | 14.18 | 0.14 | 2.23 | 16.56 | 2.28 | 0.87 | 151.07 |
| 23 | Sikkim | 0.17 | 0.00 | 0.10 | 0.00 | 0.27 | 0.03 | 0.24 | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.23 | 6.04 |
| 24 | Tamil Nadu | 7.42 | 9.76 | 1.33 | 2.59 | 21.11 | 2.04 | 19.09 | 13.68 | 0.18 | 0.57 | 14.43 | 1.36 | 6.42 | 75.59 |
| 25 | Telangana | 7.19 | 6.66 | 0.98 | 6.44 | 21.27 | 2.02 | 19.25 | 7.26 | 0.154 | 0.60 | 8.00 | 3.82 | 11.23 | 41.60 |
| 26 | Tripura | 0.81 | 0.06 | 0.22 | 0.22 | 1.31 | 0.25 | 1.06 | 0.02 | 0.00 | 0.08 | 0.10 | 0.09 | 0.96 | 9.70 |
| 27 | Uttar Pradesh | 35.44 | 13.96 | 0.82 | 21.23 | 71.45 | 6.13 | 65.30 | 40.72 | 0.41 | 5.01 | 46.14 | 5.48 | 19.99 | 70.66 |
| 28 | Uttarakhand | 1.28 | 0.31 | 0.10 | 0.32 | 2.01 | 0.16 | 1.86 | 0.63 | 0.12 | 0.15 | 0.89 | 0.15 | 0.96 | 48.04 |

Contd…

## Table 2.19: State-wise Ground Water Resources in India, 2022

(in BCM)

| Sl. No. | States/ Union Territories | Ground Water Recharge | | | | | Total Natural Discharges | Annual Extractable Ground Water Resource | Current Annual Ground Water Extraction | | | | Annual GW Allocation for Domestic use as on 2025 | Net Ground Water Availability for Future use | Stage of Ground Water Extraction (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monsoon Season | | Non-monsoon Season | | Total Annual Ground Water Recharge | | | Irrigation | Industrial | Domestic | Total | | | |
| | | Recharge from Rainfall | Recharge from other Sources | Recharge from Rainfall | Recharge from other Sources | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 29 | West Bengal | 15.46 | 1.65 | 3.04 | 3.46 | 23.61 | 2.19 | 21.42 | 8.38 | 0.14 | 1.54 | 10.07 | 1.76 | 11.29 | 47.01 |
| 30 | Andaman and Nicobar | 0.30 | 0.00 | 0.32 | 0.00 | 0.62 | 0.06 | 0.56 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.55 | 1.35 |
| 31 | Chandigarh | 0.01 | 0.01 | 0.00 | 0.03 | 0.05 | 0.01 | 0.05 | 0.01 | 0.00 | 0.03 | 0.04 | 0.03 | 0.01 | 80.99 |
| 32 | Dadra & Nagar Haveli | 0.06 | 0.01 | 0.00 | 0.02 | 0.09 | 0.01 | 0.08 | 0.01 | 0.09 | 0.01 | 0.11 | 0.02 | 0.01 | 133.20 |
| 33 | Daman & Diu | 0.04 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.04 | 0.00 | 0.06 | 0.00 | 0.06 | 0.02 | 0.00 | 157.93 |
| 34 | Jammu and Kashmir | 1.16 | 1.94 | 1.15 | 0.64 | 4.90 | 0.46 | 4.44 | 0.31 | 0.05 | 0.71 | 1.07 | 0.73 | 3.35 | 24.18 |
| 35 | Ladakh | 0.01 | 0.05 | 0.02 | 0.00 | 0.08 | 0.01 | 0.07 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.04 | 41.36 |
| 36 | Lakshadweep | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 61.60 |
| 37 | Puducherry | 0.06 | 0.09 | 0.01 | 0.04 | 0.21 | 0.02 | 0.19 | 0.08 | 0.01 | 0.05 | 0.13 | 0.05 | 0.05 | 69.17 |
| **Grand Total** | | **241.35** | **82.30** | **24.88** | **89.07** | **437.60** | **36.85** | **398.08** | **208.49** | **3.64** | **27.05** | **239.16** | **33.86** | **188.03** | **60.08** |

Source: Central Ground Water Board, D/o Water Resources, RD & GR, M/o Jal Shakti

Note: Totals may not tally due to rounding off.

*******

# Section-III

# Major & Medium Irrigation and other Projects

This Section deals with the financial aspects of water and related sectors in the country such as details on Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and its major components - Accelerated Irrigation Benefits Programme (AIBP) and Har Khet Ko Pani (HKKP). It also gives the details on the sub-components-National Projects, Command Area Development & Water Management (CAD&WM) Programme, Surface Minor Irrigation Scheme, Repair, Renovation & Restoration (RRR) of Water Bodies Scheme and PMKSY-HKKP, Ground Water Scheme. It provides the details on special package for Maharashtra/Sirhind Feeder (SF) and Rajasthan Feeder (RF). This Section also consists of the data/information on External Assistance for development of water resources, National Water Mission & Climate Change Issue and Namami Gange Programme. It also provides the data/information on Minor irrigation census and details on the Plan-wise Financial Expenditure on Minor Irrigation-Institutional. It also provides the details on the Capital Expenditure, Working Expenses and Gross Receipts for Major & Medium irrigation projects, Minor irrigation projects and CAD programme at all India level.

## 3.1 Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

i. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) was launched during the year 2015-16, with an aim to enhance physical access of water on farm and expand cultivable area under assured irrigation, improve on-farm water use efficiency, introduce sustainable water conservation practices, etc.

ii. PMKSY is an umbrella scheme, consisting of two major components being implemented by the Ministry of Jal Shakti, namely; Accelerated Irrigation Benefits Programme (AIBP) and Har Khet Ko Pani (HKKP). HKKP, in turn, consists of four sub-components; Command Area Development & Water Management (CAD&WM), Surface Minor Irrigation (SMI), Repair, Renovation and Restoration (RRR) of Water Bodies, and Ground Water (GW) Development component.

iii. In addition, PMKSY also consists of two components being implemented by other Ministries. Per Drop More Crop (PDMC) component is being implemented by Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture & Farmers Welfare. Watershed Development component (WDC) of PMKSY is being implemented by Department of Land Resources, Ministry of Rural Development.

### 3.1.1 PMKSY-AIBP

i. Under PMKSY-AIBP, 99 projects have been prioritized amongst the 149 ongoing projects under AIBP. Out of these priority projects, 46 irrigation/ERM projects have been reported as completed as on March, 2022. Total Irrigation Potential targeted under 99 Priority Project is 76.03 Lakh Ha out of which 41.39 Lakh Ha was created up to March-2016. A cumulative Irrigation Potential of 65.74 Lakh Ha out of 76.03 Lakh Ha (86.5%) has been created till March, 2022. Further, in December, 2021, implementation of PMKSY for the period of 2021-22 to 2025-26

has been approved by the Govt. of India with an outlay of Rs. 93,068.0 Cr including Rs. 37,454 Cr Central Assistance to States.

ii. Under the continuing scheme of PMKSY-AIBP, it is planned to provide financial assistance for completion of 60 ongoing Major/Medium Irrigation projects under PMKSY-AIBP, 85 ongoing CAD&WM projects and financial assistance to new Major/Medium irrigation projects including ERM projects. Since 2021-22, 05 newly MMI/ERM projects, one each from Rajasthan, Himachal Pradesh, Maharashtra, Assam and Tamil Nadu have been included in PMKSY-AIBP. During 2016-17 to 2021-22, Rs.13813.22 Cr Central Assistance was released including the new projects included under the extended PMKSY-AIBP scheme.

### 3.1.2 National Projects

i. The Government of India initially declared 14 projects as National Projects (NP) in February, 2008. Later, Cabinet Committee on Infrastructure approved inclusion of Saryu Nahar Pariyojana in the scheme of National Project on 3rd August, 2012. Polavaram Irrigation Project was included under the scheme of National Projects vide Gazette notification dated 01.03.2014. Implementation of these projects is monitored by the High Powered Steering Committee constituted by Union Cabinet with Secretary, M/o Jal Shakti, D/o WR, RD & GR as Chairman of the Committee. The proportion of Central share from 2016-17 onwards has been reduced to 60% from 75% except in case of projects in eight North Eastern States and three Himalayan States which will continue to get 90% of the cost as Central Grant.

ii. D/o WR, RD & GR, M/o Jal Shakti vide letter dated 07.02.2022 issued guidelines for Pradhan Mantri Krishi Sinchayee Yojana-Accelerated Irrigation Benefits Programme and National Projects (PMKSY-AIBP and NP), wherein the criteria for selection of the NP are as under:

(i) International projects where usage of water in India is required by a treaty or where planning and early completion of the project is necessary for the interest of the country.

or

(ii) Inter-State projects which are dragging on due to non-resolution of Inter-State issues relating to sharing of costs, rehabilitation, aspects of power production etc., including river interlinking projects.

or

(iii) Intra State projects with additional potential of more than 2 Lakh Ha and with no dispute regarding sharing of water and where hydrology is established.

or

(iv) Extension, Renovation and Modernization (ERM) projects envisaging extension/ restoration of irrigation potential of 2 Lakh Ha, subject to:

a. CAD&WM works shall be ensured in the entire command area of the ERM project.
b. CAD&WM works shall be taken up simultaneously with the ERM works so as to facilitate achievement of the benchmark efficiency for water use.
c. The management of command area system by Water Users' Association (WUAs) after the ERM works will be necessary.

iii. Independent evaluation of the project will be carried out after project implementation and the project should achieve the benchmark water use efficiency in practice, as prescribed by Central Water Commission.

### 3.1.3 PMKSY- HKKP, Command Area Development & Water Management (CAD&WM)

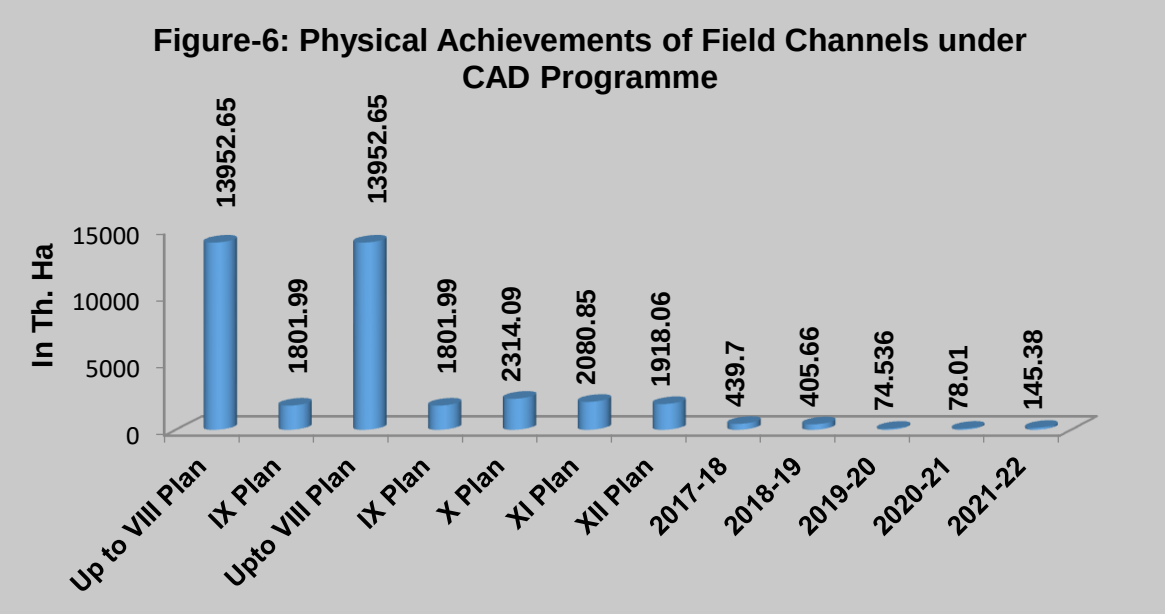
i. Initially, 60 major and medium irrigation projects were taken up under the CAD Programme, covering a Culturable Command Area (CCA) of about 15.00 Mha. At the end of FY 2015-16, there were 158 ongoing projects spread across the 29 States of the country with CCA of 16.3 Mha.

ii. Completion of CAD works of 99 prioritised AIBP projects only, are being targeted from 2016-17 onwards under PMKSY-HKKP. The arrangement of funds for Central Share/ or Central Assistance (CA) has been made by taking loan from NABARD as per year-wise requirements. A dedicated Long Term Irrigation Fund (LTIF) in NABARD has been created. Accordingly, funding of Central Assistance and State share for above mentioned 99 projects along with CAD works is being made through NABARD.

iii. Out of 99 prioritized CAD&WM projects, the State Governments have intimated that, CAD works are not required/deemed completed in 8 projects. Of the balance 91 projects, 1 Project of Rajasthan (Narmada Canal) included for Non-Structural intervention only for Central Assistance of Rs. 54.06 Cr; 87 projects in balance Culturable Command Area (CCA) of 45.08 Lakh Ha have been included under CAD&WM programme with Central Assistance (CA) of Rs. 8,235.69 Cr and targeted expenditure of Rs. 18,736.476 Cr; 3 projects namely Punpun (Bihar), Karipuzha (Kerala) & Madhya Ganga (Uttar Pradesh) are yet to be included. The physical achievements of field channels under CAD programme (in Th. Ha) are given in below:

| Sl. No. | Plan/Year | Achievements |
|---|---|---|
| **1** | **2** | **3** |
| 1 | Up to VIII Plan | 13952.65 |
| 2 | IX Plan | 1801.99 |
| 3 | X Plan | 2314.09 |
| 4 | XI Plan | 2080.85 |
| 5 | XII Plan | 1918.06 |
| 6 | 2017-18 | 439.70 |
| 7 | 2018-19 | 405.66 |
| 8 | 2019-20 | 74.536 |
| 9 | 2020-21 | 78.01 |
| 10 | 2021-22 | 145.38 |
| **Cumulative Achievement up to 31.03.2022** | | **23210.93** |

Source: Monitoring (Central) Directorate, CWC, M/o Jal Shakti




### 3.1.4 PMKSY-HKKP, Surface Minor Irrigation (SMI)

i. The scheme 'Surface Minor Irrigation (SMI)' is a part of PMKSY-HKKP. The main objective of SMI schemes is to expand cultivable area under assured irrigation. The eligibility criteria, funding pattern and release of funds in this scheme are as per the guidelines of the D/o Water Resources, RD&GR of January, 2022.

ii. Since XII Plan, 6933* SMI schemes have been reportedly included under the programme (till 31.03.2022). Out of this, 3916 schemes have been reported to be completed. So far, Central Assistance amounting to Rs. 8696.62 Cr has been released for completion of these schemes (till 31.3.2022). Out of this, an amount of Rs. 739.58 Cr was released during 2021-22. Details of SMI projects included for funding under the scheme SMI during 2021-22 are given below:

| Sl. No. | State | No. of SMI Schemes | Estimated Cost (Rs. in Cr) |
|---|---|---|---|
| 1. | Assam (Bodoland Territorial Council (BTC)) | 100 | 500.34 |
| 2. | Himachal Pradesh | 14 | 378.988 |
| 3. | Meghalaya | 75 | 346.713 |
| 4. | Mizoram | 9 | 8.509 |
| 5. | Nagaland | 213 | 133.209 |
| 6. | Sikkim | 309 | 163.545 |
| 7. | Uttarakhand | 422* | 349.39 |
| **Total** | | **1142** | **1880.69** |

Source: Economics Directorate, CWC, M/o Jal Shakti
Note: '*' not as part of 6933 SMI schemes.

iii. The Surface Minor Irrigation (SMI) component was included under Accelerated Irrigation Benefits Programme (AIBP) since 1999-2000 for special category States. Subsequently, the scheme was extended to cover other special areas, namely; drought prone area programme (DPAP), tribal area (TA), desert development programme (DDP), flood prone, left wing extremism affected and Koraput, Bolangir and Kalahandi (KBK) region of Odisha.

### 3.1.5 PMKSY-HKKP, Repair, Renovation & Restoration (RRR) of Water Bodies Scheme

i. To revive, restore and rehabilitate the traditional water bodies, Ministry of Jal Shakti (erstwhile M/o Water Resources), Government of India launched a pilot scheme for "Repair, Renovation and Restoration (RRR) of Water Bodies directly linked to Agriculture" in January, 2005 for implementation during the remaining period of X Plan. The pilot scheme envisaged a Plan outlay of Rs. 300 Cr to be shared by Centre and State in the ratio of 3:1. The scheme was sanctioned in respect of 1,098 water bodies in 26 districts of 15 States, with a target to create 0.78 Lakh Ha of additional irrigation potential. Keeping in view the success of the pilot scheme for RRR of Water Bodies, the then Ministry of Water Resources, during XI plan, launched a State Sector Scheme for Repair, Renovation & Restoration (RRR) of Water Bodies with two components (i) one with external assistance with an outlay of Rs. 1,500 Cr and (ii) the other with domestic support with an outlay of Rs. 1,250 Cr Under the scheme of external assistance, 10,887 water bodies have been taken up while under scheme of RRR of water bodies with domestic support, 3341 water bodies taken up.

ii. The scheme of RRR of Water Bodies has become a part of PMKSY-HKKP from 2015-16. Recently, Government of India has approved the scheme implementation during 2021-26 with enhanced scope. Now, in addition to water bodies directly linked to irrigation, other water bodies such as percolation tanks and the water bodies used for providing drinking water and for other community purposes which fulfil the eligibility criteria, are now proposed to be included under the scheme. During 2021-26, the scheme aims to create 0.9 Lakh Ha of irrigation potential in addition to improve availability of drinking water & conservation schemes for multifarious use. The scheme also aims to provide protection works to avoid encroachment, environmental benefits etc. Funding pattern under the scheme, for projects to be included as per the latest guidelines, is as below:

| Sl. No. | Category | Funding Pattern |
|---|---|---|
| 1 | 2 | 3 |
| 1 | All Union Territories (UTs) | 100 % Central funding for UTs without legislature;<br>90 (Centre): 10 (State) for UTs with legislature. |
| 2 | Seven North-Eastern States including Sikkim & Hilly States (Himachal Pradesh, Uttarakhand) | 90 (Central): 10 (State) |
| 3 | All others | 60 (Central) : 40 (State) |

Source: Economics Directorate, Central Water Commission, M/o Jal Shakti

iii. As per information available, during FY 2021-22, an amount of Rs. 26.05 Cr has been released for RRR of Water Bodies under PMKSY-HKKP. Also, 55.2 MCM storage has been restored and 69 Water Bodies have been physically completed.

### 3.1.6 PMKSY-HKKP, Ground Water

i. PMKSY-HKKP, Ground Water scheme, launched by the Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti, envisages providing irrigation facility for small and marginal farmers in areas having sufficient potential for future development of ground water. The scheme is being implemented with an objective to support goal of Hon'ble Prime Minister of India, for doubling the farmers' incomes. Though the scheme was approved for 2015-20, keeping in view the various requirements to implement the scheme, guidelines were revised and scheme was effectively launched in July, 2019.

ii. Beneficiaries under this scheme are small and marginal farmers only identified by State Governments. Priority is to be given to SC/ST and Women farmers. The scheme expects to give a boost to assured irrigation in tribal and backward areas (with abundant replenishable ground water) of the country, which are deprived of benefits of irrigation projects. The scheme is applicable only in areas having stage of ground water extraction less than 60%, average rainfall more than 750 mm rainfall and having shallow ground water levels (less than 15 m below ground level).

iii. Better irrigation facilities are expected to result in improved socio-economic conditions of small and marginal farmers and may enhance food production by more than two-fold in target areas. Implementation of the scheme is also expected to generate employment for skilled/unskilled personnel including ground water professionals.

iv. Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti has sanctioned 13 projects under PMKSY-HKKP-GW scheme since 2019 in 10 States namely Assam, Arunachal Pradesh, Gujarat, Nagaland, Manipur, Mizoram, Tripura, Tamil Nadu, Uttar Pradesh and Uttarakhand. The total cost of these 13 ongoing projects are Rs. 978.00 Cr and Central Assistance is Rs. 827.15 Cr of which 700.34 Cr has already been released as on 31st March, 2022 by the Ministry of Jal Shakti. The cumulative financial progress status of PMKSY-HKKP-GW as on 31st March, 2022, is given below:

| Sl. No. | State | Projects | Project Cost (Rs.in Cr) | CA Released (As on 31st March, 2022) | CA Released in 2021-22 |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Assam | Assam Phase-I | 246.69 | 435.96 | 37.80 |
| 2 | | Assam Phase-II | 292.96 | | 242.29 |
| 3 | Arunachal Pradesh | Arunachal Pradesh Phase-I | 45.30 | 79.90 | 5.99 |
| 4 | | Arunachal Pradesh Phase-II | 44.95 | | 15.30 |
| 5 | Gujarat | Gujarat | 119.19 | 34.50 | 28.50 |
| 6 | Nagaland | Nagaland | 18.15 | 15.60 | 5.85 |
| 7 | Manipur | Manipur | 61.68 | 54.40 | 21.09 |
| 8 | Mizoram | Mizoram | 16.04 | 8.66 | 0.00 |
| 9 | Tamil Nadu | Tamil Nadu | 9.13 | 5.28 | 1.61 |

**Contd…**

| Sl. No. | State | Projects | Project Cost (Rs.in Cr) | CA Released (As on 31st March, 2022) | CA Released in 2021-22 |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 10 | Tripura | Tripura Phase-I | 13.31 | 35.63 | 2.38 |
| 11 | | Tripura Phase-II | 48.34 | | 26.10 |
| 12 | Uttarakhand | Uttarakhand | 15.89 | 13.72 | 12.36 |
| 13 | Uttar Pradesh | Uttar Pradesh | 46.37 | 16.69 | 0.00 |
| **Total** | | | **978.00** | **700.34** | **399.26** |

v. As on March, 2022, 26682 wells have been constructed, 57742 Ha command area have been created and 56899 number of small & marginal farmers have been taken the benefit of PMKSY-HKKP-GW scheme so far. The cumulative physical progress status of PMKSY-HKKP-GW, as on 31st March, 2022, is given below:

| Sl. No. | Projects | Wells to be Constructed Target/ Achievement (Nos.) | Project Command Target/ Achievement (Ha) | Beneficiaries Target/ Achievement (Nos.) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | Assam Phase-I | 4779 / 4779 | 19116 / 19116 | 19643 / 19643 |
| 2 | Assam Phase-II | 4916/ 4741 | 19664/ 11216 | 17216/ 11777 |
| 3 | Arunachal Pradesh Phase-I | 473 / 473 | 1785/ 1785 | 3350/ 3350 |
| 4 | Arunachal Pradesh Phase-II | 519/ 519 | 1957/ 1957 | 3633/ 3633 |
| 5 | Nagaland | 262/ 262 | 667/ 667 | 264/ 264 |
| 6 | Tripura Phase-I | 231/ 231 | 339/ 339 | 851/ 781 |
| 7 | Tripura Phase-II | 890/ 747 | 2670/ 265 | 1639/ 235 |
| 8 | Manipur | 550/ 550 | 2057/ 2057 | 1445/ 1445 |
| 9 | Mizoram | 209/ 82 | 553/ 128 | 411/ 168 |
| 10 | Uttar Pradesh | 14752/ 13361 | 36365/ 19105 | 15252/ 13849 |
| 11 | Uttarakhand | 206/ 202 | 1030/ 255 | 1085/ 284 |
| 12 | Gujarat | 1826/ 588 | 1866/ 478 | 1908/ 604 |
| 13 | Tamil Nadu | 166/ 147 | 610/ 374 | 1233/ 866 |
| **Total** | | **29779/ 26682** | **88679/ 57742** | **67930/ 56899** |

vi. Ground water development for irrigation is planned in such a way that after implementation of the project, stage of ground water extraction should not exceed 70% at any time. The scheme includes measures to prevent over-exploitation and facilitate recharge to ground water. Suitable recharge measures are to be taken up under NRM (National Resource Management) component of MGNREGS or any other recharge scheme in the target area of the present scheme to provide sustainability to ground water. State/UT Government ensures that micro-irrigation practices are implemented in at least 30% of the proposed irrigated area in convergence with the relevant scheme(s) of Central/State/UT Governments.

**Table 3.1: State/UT-wise Details of Major and Medium Irrigation Projects under PMKSY-AIBP**

| Sl. No. | Name of States | No. of MMI Projects Benefitting under AIBP | No. of MMI Projects Completed under AIBP | No. of MMI Projects under PMKSY-AIBP | No. of completed MMI Projects under PMKSY-AIBP | CLA/Grant Released under PMKSY (Rs. in Cr) (2016-2022) | Cumulative CLA/Grant Released under AIBP as on 31.03.2022 (Rs. in Cr) |
|---|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| 1 | Andhra Pradesh | 16 | 7 | 8 | 1 | 22.64 | 1400.40 |
| 2 | Assam | 11 | 8 | 4 | 1 | 0.00 | 514.77 |
| 3 | Bihar | 9 | 5 | 2 | 0 | 110.24 | 872.14 |
| 4 | Chhattisgarh | 11 | 9 | 3 | 2 | 44.20 | 562.65 |
| 5 | Goa | 2 | 1 | 1 | 0 | 0.00 | 273.17 |
| 6 | Gujarat | 15 | 14 | 1 | 0 | 4440.24 | 13321.95 |
| 7 | Haryana | 3 | 2 | 0 | - | 0.00 | 90.54 |
| 8 | Himachal Pradesh | 4 | 1 | 1 | 0 | 2.25 | 381.14 |
| 9 | Jharkhand | 10 | 3 | 1 | 0 | 756.73 | 2004.32 |
| 10 | Karnataka | 19 | 8 | 5 | 3 | 1186.62 | 7157.47 |
| 11 | Kerala | 5 | 1 | 2 | 0 | 0.00 | 201.11 |
| 12 | Madhya Pradesh | 22 i/c phases of BDP, ISP & OSP total 33 Nos. | 15 i/c phases of BDP, ISP & OSP total 19 Nos. | 14 (21 i/c phases of BDP, ISP & OSP.) | 13 (i/c phases of BDP, ISP & OSP.) | 668.29 | 6099.92 |
| 13 | Maharashtra | 64 | 46 | 27 | 9 | 2149.51 | 12513.59 |
| 14 | Manipur | 3 | 1 | 3 | 1 | 240.11 | 1607.58 |
| 15 | Meghalaya | 1 | 0 | 0 | - | 0.00 | 4.00 |
| 16 | Odisha | 18 | 12 | 8 | 5 | 1208.88 | 5898.61 |
| 17 | Punjab | 7 | 5 | 2 | 2 | 52.42 | 724.50 |
| 18 | Rajasthan | 10 | 9 | 3 | 2 | 499.99 | 2674.04 |
| 19 | Tamil Nadu | 1 | 1 | 1 | 0 | 9.04 | 29.04 |
| 20 | Telangana | 17 | 9 | 11 | 3 | 981.49 | 4369.82 |
| 21 | Tripura | 3 | 0 | 0 | - | 0.00 | 126.29 |
| 22 | UT of Jammu & Kashmir | 18 | 13 | 3 | 3 | 39.71 | 520.49 |
| 23 | UT of Ladakh | 1 | | 1 | 0 | 2.97 | 34.63 |
| 24 | Uttar Pradesh | 18 | 11 | 4 | 1 | 1397.92 | 6011.44 |
| 25 | Uttarakhand | 2 | 1 | 0 | - | 0.00 | 609.75 |
| 26 | West Bengal | 7 | 3 | 0 | | 0.00 | 385.00 |
| **Total** | | **297*** | **187**** | **105 (112 including phases)** | **46 (i/c phases)** | **13813.22** | **69139.49** |

Source: Monitoring (Central) Directorate, Central Water Commission, M/o Jal Shakti

Note: '*' 5 projects have been deferred; '**'including 50 projects amongst 99 (106 including phases) priority projects under PMKSY-AIBP reported completed by State Governments; 'MMI': Major and Medium Irrigation.

**Table 3.2: Financial Status of Irrigation Projects under AIBP-PMKSY**

| Sl. No. | Name of States | Cumulative CLA/Grant Released up to 31.03.2016 under AIBP (Rs. in Cr) | CLA/Grant Released under PMKSY (Rs. in Cr) | | | | | | CLA/Grant Released under PMKSY-AIBP (Rs. in Cr) (2016-2022) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | Andhra Pradesh | 1377.76 | 7.40 | 15.24 | 0.00 | 0.00 | 0.00 | 0.00 | 22.64 |
| 2 | Assam | 514.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | Bihar | 761.90 | 0.00 | 46.32 | 37.82 | 11.98 | 14.12 | 0.00 | 110.24 |
| 4 | Chhattisgarh | 518.44 | 13.29 | 17.26 | 0.00 | 4.09 | 6.45 | 3.12 | 44.20 |
| 5 | Goa | 273.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | Gujarat | 8881.70 | 961.88 | 1410.49 | 1047.29 | 485.35 | 177.96 | 357.28 | 4440.24 |
| 7 | Haryana | 90.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | Himachal Pradesh | 378.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.25 | 2.25 |
| 9 | Jharkhand | 1247.59 | 145.75 | 305.10 | 305.88 | 0.00 | 0.00 | 0.00 | 756.73 |
| 10 | Karnataka | 5987.36 | 135.47 | 459.52 | 197.00 | 163.42 | 231.22 | 0.00 | 1186.62 |
| 11 | Kerala | 201.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | Madhya Pradesh | 5407.76 | 300.18 | 181.29 | 81.02 | 26.45 | 19.96 | 59.47 | 668.29 |
| 13 | Maharashtra | 10363.90 | 379.88 | 363.05 | 527.54 | 291.68 | 301.85 | 285.55 | 2149.51 |
| 14 | Manipur | 1367.48 | 126.99 | 25.42 | 21.93 | 30.5 | 23.51 | 11.75 | 240.11 |
| 15 | Meghalaya | 4.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 16 | Odisha | 4689.74 | 457.74 | 464.71 | 119.38 | 90.65 | 76.39 | 0.00 | 1208.86 |
| 17 | Punjab | 672.03 | 52.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 52.42 |
| 18 | Rajasthan | 2174.07 | 45.89 | 216.87 | 95.15 | 7.04 | 93.61 | 41.43 | 499.99 |
| 19 | Tamil Nadu | 20.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.043 | 9.04 |
| 20 | Telangana | 4075.72 | 545.44 | 13.24 | 1.99 | 214.05 | 162.82 | 43.95 | 981.49 |
| 21 | Tripura | 126.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 22 | UT of Jammu & Kashmir | 480.78 | 0.00 | 8.22 | 16.92 | 5.07 | 9.50 | 0.00 | 39.71 |
| 23 | UT of Ladakh | 31.66 | 0.00 | 1.36 | 0.00 | 0.81 | 0.81 | 0.00 | 2.97 |
| 24 | Uttar Pradesh | 4589.78 | 135.64 | 65.61 | 397.16 | 407.68 | 391.84 | 0.00 | 1397.92 |
| 25 | Uttarakhand | 609.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 26 | West Bengal | 385.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | | **55231.04** | **3307.90** | **3593.63** | **2849.08** | **1738.77** | **1510.04** | **813.84** | **13813.22** |

Source: Monitoring (Central) Directorate, Central Water Commission, M/o Jal Shakti

**Table 3.3: List of Water Resources Projects declared as National Projects**

| Sl. No. | Name of the Project | State (River/Basin) | Benefits: 1) Irrigation Potential (Ha) 2) Power (MW) 3) Storage (MCM) | Latest Estimated Cost (Rs. in Cr) | Central Assistance Released so far (Rs. in Cr) | Date of Completion/ Remarks |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **National Projects under Implementation/execution** | | | | | | |
| 1 | Gosikhurd Irrigation Project | Maharashtra (Wainganga/ Godavari) | 1) 2.50 lakh<br>2) 26.5 MW<br>3)1147.14 MCM (Gross) | 18494.57 (PL 2012-13) | 3682.472 | December, 2024 |
| 2 | Saryu Nahar Pariyojana | Uttar Pradesh (Diversion Scheme among Rivers Ghaghara, Saryu, Rapti & Bansagar/ Ganga) | 1)14.04 (NP Component:4.73)<br>2) –<br>3) Barrage | 9802.67 (PL 2016) | 2257.612 | The project was inaugurated by Hon'ble PM on 11.12.2021 |
| 3 | Polavaram Irrigation Project | Andhra Pradesh (Godavari) | 1) 4.36 Lakh<br>2) 960 MW<br>3) 5511 MCM (Gross) | 47725.74 (P.L. 2017-18) | 13592.213 | April, 2022 Revised to June'24 |
| 4 | Shahpurkandi Dam Project | Punjab (Ravi) | 1) 0.37 Lakh<br>2) 206 MW<br>3) 120.71 MCM (Gross) | 2715.7 PL Feb. 2018) | 316.41 | December, 2024 |
| 5 | Teesta Barrage Project | West Bengal (Teesta) | 1) 9.23 Lakh (NP component: 5.27 Lakh)<br>2) 1000 MW<br>3) Barrage | 2988.61 | 178.2 | Project is at standstill since 2014-15 due to land acquisition issues. |
| 6 | Renukaji Dam Project | Himachal Pradesh (Giri/Yamuna) | 1) Drinking water<br>2) 40 MW<br>3) 498 MCM Drinking (Live) | 6946.99 (PL Oct, 2018) | 1495.495* | September, 2026 [Approved by Cabinet Committee on Economic Affair (CCEA) in its meeting held on 15.12.2021] |
| 7 | Lakhwar Multipurpose Project | Uttarakhand (Yamuna) | 1) 0.3378 Lakh<br>2) 300 MW<br>3) 587.84 MCM (Gross)/39.415 MCM (Drinking)/39.415 MCM (Industrial) | 5747.17 (PL July,2018) | 38.58 | September, 2026 [Approved by Cabinet Committee on Economic Affair (CCEA) in its meeting held on 15.12.2021.] |
| 8 | Ken-Betwa Link Project | Madhya Pradesh & Uttar Pradesh (Ken & Betwa/ Yamuna Basin) | 1) 9.08 Lakh (CCA)<br>2) 130 MW<br>3) 3495 MCM (Live) | Rs 44605 Cr (PL 2020-21) | 5265.89 | March, 2028 [Approved by Cabinet Committee on Economic Affair (CCEA) in its meeting held on 08.12.2021] |
| 9 | Ujh Multipurpose Project | Jammu & Kashmir (Ujh/Ravi) | 1) 0.91 Lakh<br>2) 89.5 MW<br>3) 925 MCM (Gross)/ 20 MCM (Drinking)/ 20 MCM (Industrial) | 11907.77 (PL Dec, 2019) | ---- | Accepted by Advisory Committee of D/o WR, RD & GR on 148th meeting on 17.01.2022. The project was not accepted by the Public Investment Board (PIB), meeting held on 12th October, 2022. |

**Contd…**

**Table 3.3: List of Water Resources Projects declared as National Projects**

| Sl. No. | Name of the Project | State (River/Basin) | Benefits: 1) Irrigation Potential (Ha) 2) Power (MW) 3) Storage (MCM) | Latest Estimated Cost (Rs. in Cr) | Central Assistance Released so far (Rs. in Cr) | Date of Completion/ Remarks |
|---|---|---|---|---|---|---|
| **National Projects under Appraisal :** | | | | | | |
| 10 | Kulsi Dam Project | Assam (Kulsi - Tributary of Brahmaputra) | 1) 0.395 Lakh (GIA)<br>2) 55 MW<br>3) 525.64 MCM (Gross) | Unit-I = 1073.05<br>Unit-II = 290.12<br>E&M Cost = 91.78<br>(PLJune 2017) | ---- | ----- |
| 11 | Noa Dihing Dam Project | Arunachal Pradesh (Noa-Dihing) | 1) 0.036 Lakh (CCA)<br>2) 72 MW<br>3) 322.00 MCM (Gross) | 1291.93 (PL May, 2017) | ---- | ----- |
| 12 | Bursar HE Project | Jammu & Kashmir (Marusudar/ Chenab/Indus) | 1) 1.74 Lakh (Indirect)<br>2) 800 MW<br>3) 616.74 MCM (Gross) | 16839.90 (PL Oct 2016) | ---- | ---- |
| 13 | Kishau Multipurpose Project | Himachal Pradesh & Uttarakhand (Tons/Yamuna) | 1) 0.97 Lakh Ha<br>2) 660 MW<br>3) 1824 MCM (Gross)/ 617 MCM (Drinking) | 7193.23 (PL 2010) | ---- | Revised DPR under preparation |
| 14 | Gyspa HE Project | Himachal Pradesh (Bhaga /Chenab/ Indus) | 1) 0.50 Lakh Ha<br>2) 300 MW<br>3) 912.78 MCM (Live) | ---- | ---- | ---- |
| 15 | 2nd Ravi Beas Link Project | Punjab (Ravi Beas Link) | Harness water flowing 0.58 MAF across border (about 719.30 MCM in non-monsoon period) | ---- | ---- | ---- |
| 16 | Upper Siang Project | Arunachal Pradesh (Siang) | 1) Indirect<br>2) 9750 MW<br>3) 9.2 BCM (Live)<br>4) Flood moderation | ---- | ---- | ---- |

Source: National Projects Directorate, Central Water Commission, M/o Jal Shakti

Note:

1. In view of the SLP (C) No-19409 of 2015 (Arising out of impugned final order dated 20.11.2014 in CWP No-4739/2014 passed by Hon'ble High Court of H.P), Government of India had released as a special case one-time assistance of Rs. 446.96 Cr vide its order dated 03.10.2016 for payment of compensation to the outsees whose land has been acquired for the project.

2. Further, amount of Rs. 10.61 Cr has been released further to Himachal Pradesh vide letter dated 11.08.2021 of D/o WR, RD & GR to transfer it to Himachal Pradesh Power Corporation Limited (HPPCL) for depositing the same with the Hon'ble High Court Shimla towards land acquisition of Renukaji Dam as a grant under PMKSY-HKKP in the matter of Regular First Appeal RFA 161/2019 in compliance to Hon'ble High Court Order dated 30.07.2021.

3. Subsequently, on Account Payment of Grant Component of Central Assistance under AIBP Capital Asset (PMKSY) for the State Annual Plan 2021-22 for Rs. 1037.925 Cr were issued vide D/o WR, RD& GR Letter dated 03.03.2022.

**Table 3.4: Status of CAD&WM Component for 99 Prioritized Projects under PMKSY-HKKP**

**(CCA in Th. Ha; CA and Total Cost in Rs. Cr)**

| Sl. No. | Name of the State/UT | As per DPR/MoU | | | Expenditure Progress | | Financial Progress | | Physical Progress | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | CCA Target | CA Target | Total Cost Target | Total Expenditure 2016-22 | % | Total CA Released 2016-22 | % | Total CCA 2016-22 | % |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | Andhra Pradesh | 178.62 | 349.37 | 687.86 | 3.01 | 0.44 | 69.18 | 19.80 | 0.93 | 0.52 |
| 2 | Assam | 46.62 | 96.64 | 215.46 | 46.15 | 21.42 | 7.55 | 7.81 | 25.40 | 54.48 |
| 3 | Bihar | 30.51 | 50.66 | 142.40 | 70.57 | 49.56 | 35.82 | 70.71 | 18.27 | 59.88 |
| 4 | Chhattisgarh | 42.63 | 79.57 | 159.76 | 0.00 | 0.00 | 21.71 | 27.28 | 2.07 | 4.86 |
| 5 | Goa | 8.67 | 18.77 | 137.92 | 36.24 | 26.28 | 3.84 | 20.46 | 1.05 | 12.11 |
| 6 | Gujarat | 1363.86 | 2510.88 | 5021.76 | 3619.25 | 72.07 | 1719.16 | 68.47 | 998.18 | 73.19 |
| 7 | Jammu & Kashmir | 2.46 | 5.24 | 11.64 | 6.50 | 55.84 | 3.57 | 68.13 | 1.72 | 69.92 |
| 8 | Jharkhand | 66.65 | 133.32 | 747.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | Karnataka | 83.48 | 175.60 | 989.24 | 161.99 | 16.38 | 75.28 | 42.87 | 38.28 | 45.86 |
| 10 | Kerala | 18.48 | 48.72 | 107.30 | 3.67 | 3.42 | 2.69 | 5.52 | 0.60 | 3.25 |
| 11 | Madhya Pradesh | 595.52 | 1259.04 | 2536.99 | 648.97 | 25.58 | 310.52 | 24.66 | 261.03 | 43.83 |
| 12 | Maharashtra | 500.71 | 967.51 | 2078.20 | 397.02 | 19.10 | 148.89 | 15.39 | 125.04 | 24.97 |
| 13 | Manipur | 22.04 | 44.36 | 120.65 | 35.16 | 29.14 | 2.09 | 4.71 | 8.67 | 39.34 |
| 4 | Odisha | 236.40 | 420.40 | 1266.06 | 368.66 | 29.12 | 131.96 | 31.39 | 75.84 | 32.08 |
| 15 | Punjab | 142.66 | 228.87 | 475.48 | 50.38 | 10.60 | 18.08 | 7.90 | 20.53 | 14.39 |
| 16 | Rajasthan | 117.98 | 224.82 | 439.01 | 166.81 | 38.00 | 112.65 | 50.11 | 53.50 | 45.35 |
| 17 | Telangana | 529.03 | 702.21 | 1467.40 | 5.22 | 0.36 | 36.34 | 5.18 | 10.68 | 2.02 |
| 18 | Uttar Pradesh | 524.38 | 914.93 | 1861.67 | 0.47 | 0.03 | 156.00 | 17.05 | 0.00 | 0.00 |
| **Total** | | **4510.66** | **8230.91** | **18466.31** | **5620.07** | **30.43** | **2855.33** | **34.69** | **1641.79** | **36.40** |

Source: CAD&WM Wing, D/o Water Resources, RD & GR, M/o Jal Shakti

Note: 'CCA': Culturable Command Area; 'CA': Central Assistance

### 3.2 Special Package for Maharashtra/Sirhind Feeder (SF)/Rajasthan Feeder (RF)

i. Government of India has sanctioned a special package for completion of Irrigation Projects to address agrarian distress in Vidarbha and Marathwada and other chronically drought prone areas of rest of Maharashtra during July, 2018. The package consists of 8 Major and Medium Irrigation (MMI) Projects approved by TAC of M/o WR, RD & GR and 83 Surface Minor Irrigation (SMI) Projects. The balance estimated cost of projects of Maharashtra to be completed under this package is Rs. 13651.61 Cr as on 01.04.2018, with Rs. 3831.41 Cr being the Central Assistance (CA) by the Government of India. On completion of the balance works of these projects, additional Irrigation Potential of 3.77 Lakh Ha would be created. Project-wise details of these 8 Major & Medium Irrigation projects indicating Central Assistance released are given in Table 3.5.

ii. In addition, Government of India has sanctioned a Special Package for Relining of Sirhind Feeder for 96.00 km and Relining of Rajasthan Feeder for 100 km for the States of Punjab and Rajasthan during the year 2016 for Rs.1305.267 Cr and Rs. 671.478 Cr respectively at 2015 price level. A Central Assistance of Rs. 205.758 Cr and Rs. 620.41 Cr for Sirhind Feeder (SF) and Rajasthan Feeder (RF) were approved respectively. In addition, Rs. 50.00 Cr for Sirhind Feeder & Rs. 105.84 Cr for Rajasthan Feeder (RF) have already been released. 0.93 Lakh Ha irrigation potential has been stabilized by RF & SF of Punjab up to June, 2022. The details of both Feeder canals are as given below:

| Sl. No. | Name of the Project | Project Cost for works (Rs. Cr) | Eligible CA as per Cabinet Note (Rs. Cr) | CCA to be Created (in Th. Ha) | Expenditure Incurred till date (in Rs. Cr) | CA Released till date (in Rs. Cr) | Completion Date |
|---|---|---|---|---|---|---|---|
| 1 | Relining of Sirhind Feeder from RD 119700 to 447927 | 623.08 | 255.758 | 621 | 503.98 | 203.651 | June, 2024 |
| 2 | Relining of Rajasthan Feeder from RD 179000 to 496000 | 1210.417 | 726.25 | 1963 | 784.12 | 230.24 | June, 2024 |

Source: Monitoring (Central) Directorate, PMO, Central Water Commission, M/o Jal Shakti

**Table 3.5 (1/3): Details of Special Package Projects of Maharashtra (Cost, CA & Expenditure-Rs. in Cr. and IP in Ha)**

| Sl. No. | Project Name | Districts Benefitted | Cost of the Project in Cabinet Note | Latest Cost - Works | Approved Cost - Works | Balance Cost (Works) as on 01.04.2018 based on Latest Cost | Balance Eligible CA based on latest balance cost as on 01.04.2018 | Expenditure Incurred in 2018-19 | Expenditure Incurred in 2019-20 | Expenditure Incurred in 2020-21 | Expenditure Incurred in 2021-22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1 | Tembhu LIS Dist. Satara | Satara, Sangli, Solapur | 3108.54 | 2993.50 | 2993.50 | 1088.62 | 272.16 | 260.10 | 374.34 | 308.25 | 121.88 |
| 2 | Urmodi Dist. Satara | Satara | 1566.39 | 895.81 | 580.79 | 414.93 | 103.73 | 42.50 | 43.28 | 26.19 | 25.93 |
| 3 | Sulwade Jamphal Kanoli L.I. Scheme Dist. Dhule | Dhule | 2183.25 | 2098.60 | 2098.60 | 2071.54 | 517.89 | 1.70 | 382.19 | 327.90 | 217.99 |
| 4 | Shelgaon Barrage Medium Project, Dist.Jalgaon | Jalgaon | 620.58 | 879.49 | 879.49 | 535.45 | 133.86 | 55.94 | 188.59 | 66.19 | 169.43 |
| 5 | Ghungshi Barrage LIS Akola | Akola (V) | 462.25 | 479.65 | 479.65 | 163.78 | 40.95 | 10.21 | 15.36 | 15.66 | 36.94 |
| 6 | Purna Barrage No.2 (Nerdhamana) Dist.Akola | Akola (V) | 667.66 | 848.07 | 848.07 | 302.19 | 75.55 | 24.80 | 12.46 | 2.96 | 5.41 |
| 7 | Jigaon Dist. Buldhana | Buldhana (V), Akola (V) | 7764.39 | 7222.95 | 7222.95 | 4266.74 | 1066.69 | 561.39 | 425.63 | 688.50 | 524.28 |
| 8 | Warkhed Londhe Dist. Jalgaon | Jalgaon | 465.86 | 465.86 | 465.86 | 363.62 | 90.91 | 77.38 | 104.13 | 80.26 | 25.56 |
| **Total MMI** | | | **16838.92** | **15883.93** | **15568.91** | **9206.87** | **2301.72** | **1034.02** | **1545.98** | **1515.91** | **1128.42** |
| **Total SMI (83 Projects)** | | | **8364.84** | **8247.49** | **7067.41** | **4057.25** | **1014.31** | **633.10** | **479.14** | **0.00** | |
| **Grand Total** | | | **25203.76** | **24131.42** | **22636.32** | **13264.12** | **3316.03** | **1667.12** | **2025.12** | **1515.91** | **1128.42** |

**Contd…**

**Table 3.5 (2/3): Details of Special Package Projects of Maharashtra (Cost, CA & Expenditure-Rs. in Cr. and IP in Ha)**

| Sl. No. | Project Name | Districts Benefitted | CA Released during 2018-19 | CA Released during 2019-20 | CA Released during 2020-21 | CA Released during 2021-22 | Total CA Released so far |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 13 | 14 | 15 | 16 | 17 |
| 1 | Tembhu LIS Dist. Satara | Satara, Sangli, Solapur | 25.00 | 69.79 | 77.56 | 108.01 | 280.36 |
| 2 | Urmodi Dist. Satara | Satara | 13.27 | 10.63 | 0.00 | 14.35 | 38.25 |
| 3 | Sulwade Jamphal Kanoli L.I. Scheme Dist. Dhule | Dhule | 0.23 | 0.00 | 95.97 | 108.55 | 204.75 |
| 4 | Shelgaon Barrage Medium Project, Dist. Jalgaon | Jalgaon | 15.22 | 13.99 | 47.15 | 43.59 | 119.94 |
| 5 | Ghungshi Barrage LIS Akola | Akola (V) | 3.27 | 2.55 | 3.84 | 10.43 | 20.10 |
| 6 | Purna Barrage No.2 (Nerdhamana) Dist.Akola | Akola (V) | 0.00 | 0.00 | 12.43 | 0.74 | 13.17 |
| 7 | Jigaon Dist. Buldhana | Buldhana (V), Akola (V) | 262.03 | 17.01 | 39.53 | 336.42 | 654.99 |
| 8 | Warkhed Londhe Dist. Jalgaon | Jalgaon | 10.41 | 19.35 | 26.03 | 23.68 | 79.47 |
| **Total MMI** | | | **329.43** | **133.31** | **302.52** | **645.77** | **1411.01** |
| **Total SMI** | | | **170.58** | **166.69** | **97.49** | **79.24** | **513.99** |
| **Grand Total** | | | **500.00** | **300.00** | **400.00** | **725.01** | **1925.00** |

**Contd…**

**Table 3.5 (3/3): Details of Special Package Projects of Maharashtra (Cost, CA & Expenditure-Rs. in Cr. and IP in Ha)**

| Sl. No. | Project Name | Districts Benefitted | Ultimate Irrigation Potential (UIP) | IP Created up to March, 2017 | IP Created during 2017-18 | Balance IP as on 01.04.2018 | IP Created during 2018-19 | IP Created during 2019-20 | IP Created during 2020-21 | IP Created during 2021-22 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 1 | Tembhu LIS Dist. Satara | Satara, Sangli, Solapur | 111856.00 | 10258.00 | 5279.00 | 96319.00 | 37698.00 | 34000.00 | 11000.00 | 11374.00 |
| 2 | Urmodi Dist. Satara | Satara | 32000.00 | 6497.00 | 1131.00 | 24372.00 | 1323.00 | 4509.00 | 820.00 | 2120.00 |
| 3 | Sulwade Jamphal Kanoli L.I. Scheme Dist. Dhule | Dhule | 52720.00 | 0.00 | 0.00 | 52720.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | Shelgaon Barrage Medium Project, Dist.Jalgaon | Jalgaon | 11318.00 | 0.00 | 0.00 | 11318.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | Ghungshi Barrage LIS Akola | Akola (V) | 6660.00 | 0.00 | 0.00 | 6660.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | Purna Barrage No.2 (Nerdhamana) Dist. Akola | Akola (V) | 6954.00 | 0.00 | 0.00 | 6954.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | Jigaon Dist. Buldhana | Buldhana (V), Akola (V) | 101088.00 | 0.00 | 0.00 | 101088.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | Varkhede Londhe Dist. Jalgaon | Jalgaon | 7919.00 | 0.00 | 0.00 | 7919.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total MMI** | | | **330515.00** | **16755.00** | **6410.00** | **307350.00** | **39021.00** | **38509.00** | **11820.00** | **13494.00** |
| **Total SMI** | | | **75925.00** | **8766.00** | **1571.00** | **65588.00** | **4712.00** | **7101.00** | **3128.00** | **10420.00** |
| **Grand Total** | | | **406440.00** | **25521.00** | **7981.00** | **372938.00** | **43733.00** | **45610.00** | **14948.00** | **23914.00** |

Source: Monitoring (Central) Directorate, PMO, Central Water Commission, M/o Jal Shakti

Note: 'CA': Central Assistance; 'MMI': Major & Medium Irrigation; 'SMI': Surface Minor Irrigation; 'IP': Irrigation Potential.

### 3.3 External Assistance for Development of Water Resources

i. External assistance flows to the country in various forms; as multilateral or bilateral aid, loan, grants and commodity aid from various foreign countries and other donor agencies such as World Bank, Japan International Cooperation Agency (JICA), Asian Development Bank (ADB), Asian Infrastructure Investment Bank (AIIB) etc. for the implementation of irrigation and multipurpose projects.

ii. External Assistance Directorate of Central Water Commission functions as a nodal Directorate for the techno-economical appraisal of such irrigation and multipurpose project proposals seeking external assistance, received from State Governments. The important activities of Central Water Commission in Externally Aided Irrigation projects are:

(i) Examining Concept Notes/Preliminary Project Report (PPR) of proposed Externally Aided Projects (EAPs) for in- principle consent for preparation of DPR.

(ii) Techno-economic Appraisal of DPR of proposed EAPs and preparation of TAC Note for putting the same before the Advisory Committee of the D/o WR, RD&GR on Irrigation, Flood Control and Multipurpose Projects.

### 3.4 National Water Mission and Climate Change Issue

i. The 'National Water Mission' was formulated by the erstwhile Ministry of Water Resources, River Development and Ganga Rejuvenation (now Ministry of Jal Shakti) with main 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'. The Mission, duly approved by the Government, has set five goals to achieve the above objective, which are:

(i) Comprehensive water database in public domain and assessment of the impact of climate change on water resource.

(ii) Promotion of citizen and State actions for water conservation, augmentation and preservation.

(iii) Focused attention on vulnerable areas including over-exploited areas

(iv) Increasing water use efficiency by 20% in all sector

(v) Promotion of basin level integrated water resources management.

ii. Climate Change cell was created in CWC in August, 2007 to deal with all the studies, works and reports on the subject regarding impact of climate change on water resources being referred to CWC. CWC provides inputs and assistance to NWM Secretariat in examining the research proposals related to climate change received in NWM Secretariat. D/o WR, RD & GR, M/o Jal Shakti has established six Chairs in Academic institutes-IIT Kanpur, IIT Kharagpur, IIT Guwahati, IIT Roorkee, NIT Patna and NIT Srinagar with the objective of carrying out studies and research on 'Impact of climate change on Water Resources'. Monitoring of Glacial lakes/Water bodies in the Himalayan Region of Indian River Basin is being carried out on monthly basis from June to October. The main objective of the study is to monitor the changes in the spatial extent of the glacial lakes and water bodies greater than 50 Ha area with the area of base year 2009 using satellite data received from NRSC, Hyderabad. Monthly Monitoring Reports are sent to Central/State Government agencies and other stakeholders. Base line Study of 22 completed important projects was taken up by NWM to know the status of water use activity.

### 3.5 Namami Gange Programme

i. The Government of India launched an Integrated Ganga Conservation Mission/Programme under National Ganga River Basin Authority (NGRBA) called 'Namami Gange' designed as an umbrella programme, aiming at integrating previous & ongoing initiatives (including NGRBA projects) by enhancing efficiency, extracting synergies, and supplementing them with more comprehensive & better coordinated interventions. The programme was launched with the following objectives:

(i) To ensure effective abatement of pollution and rejuvenation of the river Ganga by adopting a river basin approach to promote inter-sectoral co-ordination for comprehensive planning and management.

(ii) To maintain required ecological flows in the river Ganga with the aim of ensuring water quality and environmentally sustainable development.

ii. Accordingly, the key Ministries comprising of (a) Water Resources, River Development and Ganga Rejuvenation, (b) Environment, Forest & Climate Change, (c) Urban Development, (d) Drinking Water Supply and Sanitation, (e) Rural Development, (f) Tourism, and (g) Shipping; worked together since June, 2014 to arrive at a comprehensive action plan.

iii. Cabinet approved the Namami Gange programme on 13th May, 2015 as a comprehensive approach to rejuvenate river Ganga and its tributaries under one umbrella. A total of Rs. 20,000 Cr have been allocated for this project to be spent over the next five years (2020). This includes funds allocated for ongoing projects to clean river Ganga and new initiatives. The first phase of the NMCG has ended in 2021 and Namami Gange Mission II (NGM II) has been approved in February, 2022 till 2026.

**Table 3.6 (a): Project Summary under Namami Gange Programme for the year 2021-22**

| Sl. No. | Type of Project | Name of State | Sanctioned | | | | Completed | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | No. of Projects | Capacity (MLD) | Network (km) | Cost (Rs. in Cr) | No. of Projects | MLD Created/ Rehabilitated | Network (km) |
| 1 | Sewerage Projects | Uttarakhand | 36 | 194.80 | 184.33 | 1,373.19 | 33 | 161.80 | 161.73 |
| | | Uttar Pradesh | 53 | 1699.19 | 1834.96 | 10563.17 | 30 | 539.46 | 1778.91 |
| | | Bihar | 30 | 648.00 | 1754.42 | 5531.00 | 5 | 150.00 | 909.12 |
| | | Jharkhand | 3 | 30.50 | 89.86 | 217.00 | 1 | 12.00 | 87.68 |
| | | West Bengal | 24 | 906.77 | 1049.43 | 4100.00 | 4 | 129.53 | 839.64 |
| | | Haryana | 2 | 145.00 | 41.00 | 218.00 | 2 | 145.00 | 51.62 |
| | | Delhi | 9 | 1268.00 | 37.32 | 1951.00 | 5 | 318.00 | 36.00 |
| | | Himachal Pradesh | 1 | 1.72 | - | 12.00 | 1 | 1.72 | - |
| | | Rajasthan | 1 | 36.00 | 146.00 | 258.00 | 0 | 30.00 | 87.80 |
| | | Modular STP Decentralized | 1 | - | - | 410.00 | - | - | - |
| | | **Total (a)** | **160** | **4929.98** | **5137.29** | **24633.36** | **81** | **1487.51** | **3952.35** |

Source: Annual Report 2021-22 of National Mission for Clean Ganga (NMCG), M/o Jal Shakti

**Table 3.6 (b): Project Summary under Namami Gange Programme for the year 2021-22 other than Sewerage Projects**

| Sl. No. | Type of Project | Sanctioned | | | | Completed | | |
|---|---|---|---|---|---|---|---|---|
| | | No. of Projects | Capacity (MLD) | Network (km) | Cost (in Rs. Cr) | No. of Projects | MLD Created/ Rehabilit-ated | Network (km) |
| 1 | River Front, Ghats and Crematoria | 90 | - | - | 1553.86 | 68 | - | - |
| 2 | Afforestation and Biodiversity conservation | 41 | - | - | 635.00 | 31 | - | - |
| 3 | Ghats Cleaning & River Surface Cleaning | 5 | - | - | 85.00 | 1 | - | - |
| 4 | Industrial Pollution Abatement | 17 | - | - | 1427.00 | 2 | - | - |
| 5 | Rural Sanitation | 1 | - | - | 1421.00 | 0 | - | - |
| 6 | Other Projects | 52 | - | - | 916.53 | 14 | - | - |
| **Total (b)** | | **206** | **-** | **-** | **6038.39** | **116** | **-** | **-** |
| **Grand Total (a+b)** | | **366** | **4929.98** | **5137.29** | **30671.75** | **197** | **1487.51** | **3952.35** |

Source: Annual Report 2021-22 of National Mission for Clean Ganga (NMCG), M/o Jal Shakti

### 3.6 Minor Irrigation (MI) Census

i. All ground water schemes and surface water schemes (both flow and lift) having Culturable Command Area (CCA) up to 2,000 Ha individually, are classified as Minor Irrigation schemes. A major share of irrigation is contributed by minor irrigation schemes across the country and the share of different type of minor irrigation schemes has also been changing over time. In order to study the composition of the minor irrigation sector and other related aspects, there was a need for a sound and reliable database on the minor irrigation sector, which could provide a strong foundation for planning and policy formulation. In order to meet this objective, Minor Irrigation Censuses are being conducted under the 'Rationalisation of Minor Irrigation Statistics (RMIS)' scheme till date.

ii. The Centrally Sponsored Plan Scheme RMIS was launched in 1987-88 with 100% Central assistance to the States/UTs. Currently, Irrigation Census (parent component of 'RMIS') is a standalone component under Umbrella Scheme- 'Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)' and other Schemes.

iii. So far, five Censuses have been conducted with reference years 1986-87, 1993-94, 2000-01, 2006-07 & 2013-14 respectively. The report of 5$^{th}$ MI census was published in 2017 and is available on the website of the Department of Water Resources, RD & GR, M/o Jal Shakti. The sixth MI census with reference year 2017-18 is going on. The Census throws light on important aspects like Irrigation Potential Created and Utilized through minor irrigation structures- both ground and surface water, water distribution practices employed by owners of these schemes and also sources used for energisation of these schemes.

iv. The Plan-wise expenditure on Minor Irrigation is presented in the following Table 3.7. It is seen that the expenditure on Minor irrigation during 2012-17 was Rs. 4712.32 Cr. It is observed that the expenditure of minor irrigation during 2017-18 was Rs. 1512.71 Cr and from the year 2017-18 it shows a decreasing trend till the year 2020-21 while in the year 2021-22 it was Rs. 1404.33 Cr which was more than double of the expenditure during 2020-21 of Rs. 680.03 Cr.

v. While analyzing the State-wise expenditure on Minor irrigation for the year 2021-22, it was found that the maximum expenditure was in Maharashtra followed by Karnataka, Tamil Nadu, Kerala, Bihar, Rajasthan, Gujarat, Uttar Pradesh, Andhra Pradesh, Haryana and Telangana. The expenditure in respect of these States was about 98.7% of the total expenditure during the year 2021-22. During 2021-22, the expenditure on minor irrigation was highly increased in Uttar Pradesh, Bihar and Rajasthan in comparison to their expenditure in previous years. The details on the financial expenditure on Minor Irrigation-Institutional, are given in the following Table:

**Table 3.7: Plan-wise Financial Expenditure on Minor Irrigation-(Institutional)**

**(Rs. in Cr)**

| Sl. No. | States/UTs | During XII Plan | Year | | | | |
|---|---|---|---|---|---|---|---|
| | | (2012-17) | (2017-18) | (2018-19) | (2019-20) | (2020-21) | (2021-22) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | Andhra Pradesh | 164.18 | 34.94 | 37.02 | 35.90 | 27.01 | 49.83 |
| 2 | Arunachal Pradesh | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | Assam | 1.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | Bihar | 168.44 | 80.84 | 0.09 | 1.22 | 87.14 | 162.78 |
| 5 | Chhattisgarh | 47.96 | 7.59 | 2.59 | 0.69 | 0.57 | 6.97 |
| 6 | Goa | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | Gujarat | 628.24 | 90.69 | 91.59 | 51.60 | 19.29 | 36.07 |
| 8 | Haryana | 273.38 | 71.43 | 19.71 | 0.01 | 14.28 | 47.42 |
| 9 | Himachal Pradesh | 10.04 | 0.00 | 10.81 | 7.50 | 8.65 | 2.20 |
| 10 | Jammu & Kashmir | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | Jharkhand | 4.95 | 0.00 | 0.02 | 0.01 | 0.00 | 0.03 |
| 12 | Karnataka | 463.46 | 339.03 | 256.34 | 242.57 | 145.43 | 199.42 |
| 13 | Kerala | 408.12 | 74.18 | 45.23 | 141.83 | 92.00 | 45.14 |
| 14 | Madhya Pradesh | 139.37 | 6.08 | 18.54 | 0.06 | 10.70 | 0.55 |
| 15 | Maharashtra | 1089.26 | 486.33 | 302.27 | 242.78 | 165.44 | 459.33 |
| 16 | Manipur | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 17 | Meghalaya | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 18 | Mizoram | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 19 | Nagaland | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 20 | Odisha | 25.79 | 0.01 | 0.03 | 0.04 | 0.00 | 0.00 |
| 21 | Punjab | 254.34 | 22.45 | 21.78 | 9.79 | 0.05 | 6.19 |
| 22 | Rajasthan | 274.79 | 74.54 | 9.67 | 10.71 | 12.75 | 182.07 |
| 23 | Sikkim | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 24 | Tamil Nadu | 484.54 | 188.58 | 180.03 | 54.35 | 92.87 | 7.74 |
| 25 | Telangana | 0.00 | 21.66 | 11.49 | 53.10 | 2.92 | 13.17 |
| 26 | Tripura | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 27 | Uttarakhand | 0.03 | 0.00 | 0.01 | 0.00 | 0.00 | 1.60 |
| 28 | Uttar Pradesh | 266.30 | 14.32 | 28.08 | 1.03 | 0.26 | 183.58 |
| 29 | West Bengal | 6.80 | 0.04 | 0.03 | 0.00 | 0.00 | 0.10 |
| **Union Territories** | | | | | | | |
| 30 | A & N Islands | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 31 | Chandigarh | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 32 | Dadra & Nagar Haveli | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 33 | Daman & Diu | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 34 | Delhi | 0.00 | 0.00 | 0.07 | 0.22 | 0.00 | 0.14 |
| 35 | Puducherry | 1.08 | 0.00 | 0.08 | 0.31 | 0.67 | 0.00 |
| 36 | Lakshadweep | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Grand Total** | | **4712.32** | **1512.71** | **1035.48** | **853.72** | **680.03** | **1404.33** |

Source: Minor Irrigation Wing, D/o Water Resources, RD&GR, M/o Jal Shakti

Note: Totals may not tally due to rounding off.

### 3.7 Capital Expenditure, Working Expenses and Gross Receipts for Major & Medium Irrigation Projects, Minor Irrigation Projects and Command Area Development (CAD) Programme

i. The Revenue receipt and Revenue & Capital expenditure on irrigation projects are compiled from the Finance Accounts of Union Government as well as State Governments. The revenue receipt and the revenue & capital expenditure of all economic activities carried out for irrigation projects are classified as per the following 4-digit codes:

4700, 4701: Capital Expenditure on Major and Medium Irrigation Projects
4702: Capital Expenditure on Minor Irrigation Projects
4705: Capital Expenditure on Command Area Development (CAD)

ii. The Finance Accounts of C&AG and AG of all States follow the same coding of Major Heads for revenue receipt and revenue & capital expenditure uniformly across the country and compilation of financial aspects of Irrigation Projects as mentioned above is based on these Finance Accounts.

iii. The Capital Expenditure represents money spent to acquire or upgrade physical assets such as construction of concrete/masonry dams, reservoirs, spillways, canals networks of the irrigation project etc. during a financial year. The Working Expenses refer to non-plan expenditure incurred on Direction and Administration, Machinery and Equipment, Training, survey and investigation, research and other expenditures during a financial year on different economic activities carried out for construction of irrigation projects.

iv. The revenue expenditure represents expenditure incurred on a spectrum of activities like Direction and Administration, Procurement of Machinery and Equipment, Maintenance & Repair, Extension & Improvement of Completed Projects, Survey and Investigation and Construction Activities for new projects, Training and Research and other expenditure etc. Similarly, the expenditure incurred to meet day to day affairs of projects and petty expenses are booked under Miscellaneous Account termed as General/ Other Expenditure. It is also understood that expenditure incurred on Maintenance & Repair and Extension and Improvement of Completed Projects and expenditure incurred on projects which are yet to be approved by competent authority of Central and State Government are also included under Other Expenditure. Besides these activities, the expenditure not appropriately booked under a specific head of accounts is kept under Suspense Account. Similarly, Gross Receipt is the revenue receipt on account of water charges and other levies as imposed by the State Government from time to time.

v. In case of Minor irrigation projects; Working Expenses refer to a spectrum of activities like (i) construction of Water Tank, Lift Irrigation, Tribal Sub-Plan and Other Expenditures under Surface Water schemes/ projects, (ii) Survey and Investigation, construction of Tube wells/ subsidy to beneficiaries and Other Expenditures in Ground Water schemes and (iii) Direction and Administration, Procurement of Machinery and Equipments, Tribal Sub-Plan and Other Expenses in general for Minor Irrigation projects.

vi. The Working Expenses in Command Area Development Programme consist of Direction and Administration, Ayacut Development, Dry Land Development, Development of Hill Areas/Desert Area, Tribal Area Sub-Plan and Other Expenses. The Command Area Development Programme per se take up activities like construction of field channels, lining of channels, land levelling and warabandi of small catchments areas besides removal of alkalinity and salinity of land for agriculture use. The terminology of Ayacut and Dry Land development etc. conforms to construction of field channels, land levelling and other activities as mentioned above.

**Table 3.8: Capital Expenditure, Working Expenses and Gross Receipts for Major and Medium Irrigation Projects at all India Level**

**(Rs. in Cr)**

| Year | Annual | Capital Expenditure | | Working Expenses | | | Gross Receipts |
|---|---|---|---|---|---|---|---|
| | Plan | During the Year | Up to the end of the Year | Direction and Administration | Expenses other than Direction and Administration | Total | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1992-93 | VIII Plan | 3416.32 | 37077.90 | 256.88 | 2905.25 | 3162.13 | 320.29 |
| 1993-94 | | 3975.27 | 41053.17 | 295.55 | 3334.29 | 3629.85 | 477.58 |
| 1994-95 | | 4806.07 | 45859.24 | 341.53 | 4010.91 | 4352.44 | 444.46 |
| 1995-96 | | 5458.64 | 51317.88 | 424.76 | 4393.77 | 4818.53 | 95.43 |
| 1996-97 | | 5494.42 | 56812.30 | 472.62 | 4973.02 | 5445.64 | 58.39 |
| **Sub-Total** | | **23150.72** | - | **1791.34** | **19617.24** | **21408.59** | **2196.15** |
| 1997-98 | IX Plan | 7137.93 | 63950.23 | 853.49 | 5404.43 | 6257.92 | 363.34 |
| 1998-99 | | 7093.71 | 71043.94 | 929.64 | 6285.74 | 7215.38 | 441.80 |
| 1999-00 | | 7874.72 | 78918.66 | 1167.66 | 6812.55 | 7980.22 | 56.94 |
| 2000-01 | | 6821.63 | 85740.29 | 993.48 | 7768.94 | 8762.42 | 753.52 |
| 2001-02 | | 7649.38 | 93389.67 | 1396.63 | 6842.56 | 8239.19 | 652.25 |
| **Sub-Total** | | **36577.37** | **-** | **5340.90** | **33114.22** | **38455.13** | **2667.85** |
| 2002-03 | X Plan | 10161.31 | 103551.00 | 1444.52 | 7401.38 | 8845.90 | 783.39 |
| 2003-04 | | 14463.44 | 118014.40 | 1431.83 | 4861.78 | 6293.60 | 1047.60 |
| 2004-05 | | 17652.23 | 135666.70 | 1556.67 | 5461.65 | 7018.31 | 1264.15 |
| 2005-06 | | 21964.79 | 157631.40 | 2012.43 | 6203.62 | 8216.06 | 1194.70 |
| 2006-07 | | 26542.23 | 184173.70 | 2442.34 | 7162.09 | 9604.43 | 1504.66 |
| **Sub-Total** | | **90784.00** | **-** | **8887.79** | **31090.52** | **39978.30** | **794.50** |
| 2007-08 | XI Plan | 30879.23 | 215052.90 | 3101.12 | 8797.76 | 11898.88 | 2044.92 |
| 2008-09 | | 36230.56 | 251283.50 | 3565.20 | 8631.66 | 12196.86 | 1903.97 |
| 2009-10 | | 32074.86 | 283358.30 | 4654.78 | 10266.14 | 14920.92 | 2351.11 |
| 2010-11 | | 32303.61 | 315661.90 | 5504.71 | 11858.86 | 17363.58 | 2597.52 |
| 2011-12 | | 33895.28 | 349557.20 | 6110.55 | 12609.55 | 18720.10 | 3892.87 |
| **Sub-Total** | | **165383.5** | **-** | **22936.36** | **52163.97** | **75100.34** | **12790.39** |
| 2012-13 | XII Plan | 36097.64 | 385654.90 | 6497.26 | 14851.62 | 21348.87 | 3128.30 |
| 2013-14 | | 36666.20 | 422321.10 | 6838.53 | 15288.23 | 22126.76 | 4348.74 |
| 2014-15 | | 38535.84 | 460856.90 | 6978.80 | 15419.01 | 22097.82 | 4155.10 |

**Contd…**

**Table 3.8: Capital Expenditure, Working Expenses and Gross Receipts for Major and Medium Irrigation Projects at all India Level**

**(Rs. in Cr)**

| Year | Annual | Capital Expenditure | | Working Expenses | | | Gross Receipts |
|---|---|---|---|---|---|---|---|
| | Plan | During the Year | Up to the end of the Year | Direction and Administration | Expenses other than Direction and Administration | Total | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 2015-16 | XII Plan | 50458.03 | 511314.90 | 7265.30 | 12480.75 | 19483.24 | 6218.30 |
| 2016-17 | | 62015.20 | 573330.10 | 7376.53 | 11629.13 | 19005.66 | 4243.95 |
| **Sub-Total** | | **215631.60** | **-** | **34956.40** | **69668.74** | **104062.40** | **22094.40** |
| 2017-18 | | 61782.18 | 635112.30 | 7907.85 | 11357.19 | 19265.04 | 7010.89 |
| 2018-19 | | 70392.94 | 705505.20 | 8484.88 | 11738.75 | 20223.62 | 638.97 |
| 2019-20 | | 62991.51 | 768496.80 | 8348.54 | 13533.84 | 21882.38 | 4894.44 |
| **Sub-Total** | | **195166.60** | **-** | **24741.26** | **36629.78** | **61371.04** | **7544.30** |
| **Grand Total** | | **726693.80** | **-** | **98654.07** | **242284.50** | **340375.80** | **63087.58** |

Source: Combined Finance and Revenue Accounts-Union & State by Comptroller and Auditor General of India (CAG)
(https://cag.gov.in/en/combined-accounts?arch=1,https://cag.gov.in/en/combined-accounts)

**Table 3.9: Capital Expenditure, Working Expenses and Gross Receipts for Minor Irrigation Projects at All India Level**

**(Rs. in Cr)**

| Year | Annual Plan/ 5-Year Plan | Capital Expenditure | | Working Expenses | | | Gross Receipts |
|---|---|---|---|---|---|---|---|
| | | During the Year | Up to the end of the Year | Direction and Administration | Expenses other than Direction & Administration | Total | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1992-93 | VIII Plan | 559.84 | 6502.96 | 71.26 | 879.18 | 950.44 | 58.47 |
| 1993-94 | | 635.33 | 7138.29 | 82.27 | 1377.25 | 1459.52 | 68.98 |
| 1994-95 | | 732.40 | 7870.69 | 107.02 | 1510.47 | 1617.49 | 98.84 |
| 1995-96 | | 756.33 | 8627.02 | 117.09 | 1638.68 | 1755.77 | 111.52 |
| 1996-97 | | 889.95 | 9516.97 | 138.30 | 1775.35 | 1913.64 | 103.84 |
| **Sub-Total** | | **3573.85** | - | **515.94** | **7180.93** | **7696.86** | **441.65** |
| 1997-98 | IX Plan | 906.22 | 10423.19 | 169.65 | 1737.28 | 1906.93 | 115.92 |
| 1998-99 | | 1006.68 | 11429.87 | 215.83 | 1912.91 | 2128.74 | 101.37 |
| 1999-00 | | 1141.59 | 12571.46 | 261.62 | 1475.22 | 1736.83 | 95.26 |
| 2000-01 | | 965.23 | 13536.69 | 271.08 | 1733.24 | 2004.33 | 80.14 |
| 2001-02 | | 1038.38 | 14575.07 | 276.88 | 1829.79 | 2106.66 | 80.15 |
| **Sub-Total** | | **5058.10** | - | **1195.06** | **8688.44** | **9883.49** | **472.84** |
| 2002-03 | X Plan | 1065.81 | 15640.88 | 316.67 | 1741.33 | 2058.00 | 101.18 |
| 2003-04 | | 1608.77 | 17249.65 | 357.75 | 1659.57 | 2017.33 | 127.91 |
| 2004-05 | | 2469.54 | 19719.19 | 390.58 | 1960.33 | 2350.91 | 144.68 |
| 2005-06 | | 2884.00 | 22603.19 | 426.00 | 2096.97 | 2522.97 | 169.78 |
| 2006-07 | | 3020.37 | 25623.56 | 536.27 | 2396.44 | 2932.71 | 177.32 |
| **Sub-Total** | | **11048.49** | - | **2027.27** | **9854.64** | **11881.92** | **720.87** |
| 2007-08 | XI Plan | 4045.68 | 29669.24 | 657.02 | 3000.30 | 3657.32 | 209.10 |
| 2008-09 | | 4622.89 | 34292.13 | 695.22 | 3633.08 | 4328.30 | 216.24 |
| 2009-10 | | 5669.51 | 39961.64 | 854.31 | 3953.55 | 4805.09 | 579.81 |
| 2010-11 | | 6952.23 | 46913.87 | 977.76 | 4190.99 | 5205.58 | 641.18 |
| 2011-12 | | 8456.32 | 55370.19 | 1140.12 | 4738.88 | 5879.00 | 453.89 |
| **Sub-Total** | | **29746.63** | - | **4324.43** | **19516.8** | **23875.29** | **2100.22** |
| 2012-13 | XII Plan | 9323.12 | 64693.31 | 1308.04 | 5016.87 | 6324.91 | 911.89 |
| 2013-14 | | 10197.89 | 74891.2 | 1390.38 | 5307.87 | 6698.25 | 917.66 |
| 2014-15 | | 10095.68 | 84986.88 | 1477.96 | 5345.41 | 6823.37 | 733.90 |
| 2015-16 | | 12435.53 | 97422.41 | 1574.04 | 5607.83 | 7481.71 | 736.20 |
| 2016-17 | | 13971.51 | 111393.92 | 1616.18 | 5760.80 | 7376.98 | 831.27 |
| **Sub-Total** | | **55904.73** | **-** | **7366.6** | **27038.78** | **34705.22** | **4130.92** |
| 2017-18 | | 14759.68 | 126153.60 | 1778.96 | 6475.00 | 8253.96 | 740.18 |
| 2018-19 | | 16417.51 | 142571.10 | 1938.95 | 6177.21 | 8116.15 | 1067.03 |
| 2019-20 | | 13732.52 | 156303.60 | 1494.92 | 7033.95 | 8528.87 | 905.63 |
| **Sub-Total** | | **44909.72** | **-** | **5212.82** | **19686.16** | **24898.98** | **2712.85** |
| **Grand Total** | | **150241.52** | **-** | **20642.12** | **91965.75** | **112941.76** | **10579.35** |

Source: Combined Finance and Revenue Accounts-Union & State by Comptroller and Auditor General of India (CAG) (as per the latest availability of data)
(https://cag.gov.in/en/combined-accounts?arch=1, https://cag.gov.in/en/combined-accounts)

**Table 3.10: Capital Expenditure, Working Expenses and Gross Receipts for CAD Programme**

**(Rs. in Cr)**

| Year | Annual Plan | Capital Expenditure | | Working Expenses | | | Gross Receipts |
|---|---|---|---|---|---|---|---|
| | | During the year | Up to the end of the year | Direction and Administration | Expenses other than Direction & Administration | Total | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1992-93 | VIII Plan | 83.04 | 606.04 | 0.60 | 210.11 | 210.70 | 0.00 |
| 1993-94 | | 71.11 | 677.15 | 0.60 | 246.65 | 247.25 | 0.00 |
| 1994-95 | | 83.38 | 760.53 | 0.73 | 267.27 | 268.00 | 0.00 |
| 1995-96 | | 89.70 | 850.23 | 0.85 | 336.42 | 337.27 | 0.00 |
| 1996-97 | | 135.02 | 985.25 | 0.82 | 297.34 | 298.16 | 0.00 |
| **Sub-Total** | | **462.25** | - | **3.60** | **1357.79** | **1361.38** | **0.00** |
| 1997-98 | IX Plan | 109.69 | 1094.94 | 1.04 | 316.67 | 317.71 | 0.00 |
| 1998-99 | | 119.54 | 1214.48 | 1.39 | 334.26 | 335.65 | 0.00 |
| 1999-00 | | 109.30 | 1323.78 | 1.67 | 354.71 | 356.39 | 0.00 |
| 2000-01 | | 157.43 | 1481.21 | 1.20 | 393.20 | 394.40 | 0.00 |
| 2001-02 | | 152.26 | 1633.47 | 1.18 | 354.16 | 355.34 | 0.00 |
| **Sub-Total** | | **648.22** | - | **6.48** | **1753.00** | **1759.49** | 0.00 |
| 2002-03 | X Plan | 97.01 | 1730.48 | 22.60 | 442.30 | 464.89 | 0.00 |
| 2003-04 | | 77.47 | 1807.95 | 2.51 | 427.59 | 430.10 | 0.00 |
| 2004-05 | | 139.50 | 1947.45 | 2.85 | 360.60 | 363.45 | 0.00 |
| 2005-06 | | 165.59 | 2113.04 | 49.32 | 374.00 | 423.31 | 0.00 |
| 2006-07 | | 172.95 | 2285.99 | 57.91 | 403.61 | 461.52 | 0.00 |
| **Sub-Total** | | **652.52** | - | **135.19** | **2008.10** | **2143.27** | 0.00 |
| 2007-08 | XI Plan | 233.84 | 2519.83 | 33.10 | 493.97 | 527.07 | 0.00 |
| 2008-09 | | 255.11 | 2774.94 | 36.60 | 444.78 | 481.38 | 0.00 |
| 2009-10 | | 319.04 | 3093.98 | 78.86 | 502.98 | 581.83 | 0.00 |
| 2010-11 | | 551.42 | 3645.40 | 91.79 | 605.94 | 697.73 | 0.00 |
| 2011-12 | | 332.46 | 3977.86 | 107.02 | 786.58 | 893.61 | 0.00 |
| **Sub-Total** | | **1691.87** | - | **347.37** | **2834.25** | **3181.62** | 0.00 |
| 2012-13 | XII Plan | 483.34 | 4461.20 | 69.52 | 793.52 | 868.43 | 0.00 |
| 2013-14 | | 616.95 | 5078.15 | 112.99 | 785.87 | 898.86 | 0.00 |
| 2014-15 | | 507.33 | 5585.48 | 133.21 | 758.14 | 890.95 | 0.00 |
| 2015-16 | | 661.86 | 6247.34 | 112.67 | 1061.06 | 1173.72 | 0.00 |
| 2016-17 | | 1086.47 | 7333.81 | 144.12 | 915.40 | 1059.54 | 0.00 |
| **Sub-Total** | | **3355.95** | **-** | **572.51** | **4313.99** | **4891.50** | **0.00** |
| 2017-18 | | 633.09 | 7966.90 | 268.68 | 796.27 | 1064.94 | 0.00 |
| 2018-19 | | 397.67 | 8364.57 | 170.18 | 640.34 | 810.52 | 0.00 |
| 2019-20 | | 334.37 | 8698.94 | 125.67 | 543.45 | 669.12 | 0.00 |
| **Sub-Total** | | **1365.13** | **-** | **564.53** | **1980.06** | **2544.58** | **0.00** |
| **Grand Total** | | **8175.94** | **-** | **1629.68** | **14247.19** | **15881.84** | **0.00** |

Source: Combined Finance and Revenue Accounts-Union & State by Comptroller and Auditor General of India (CAG) (as per the latest availability of data)
(https://cag.gov.in/en/combined-accounts?arch=1, https://cag.gov.in/en/combined-accounts)

*******

# Section-IV
# Flood Management

i. Floods are recurrent phenomena in India. Due to different climatic and rainfall patterns in different regions, it has been experienced that, while some parts are suffering from devastating floods, another part is suffering drought at the same time. With the increase in population and development activity, there has been a tendency to occupy the flood plains, which has resulted in damage of a more serious nature over the years. Often, because of the varying rainfall distribution, areas which are not traditionally prone to floods also experience severe inundation. Flooding is caused by the inadequate capacity within the banks of the rivers to contain the high flows brought down from the upper catchments due to heavy rainfall. Flood management refers to all the methods used to reduce or prevent the detrimental effects of flood waters.

ii. This Section deals with State-wise and Basin-wise Flood Forecasting Stations, Flood Forecasting Performance, Flood Damage, Flood Management Programme (FMP), Flood Management and Border Areas Programme (FMBAP), River Management Activities & works related to Border Areas (RMBA) Component and distribution of Revenue & Capital Expenditure incurred by sub-major head of accounts.

**Table 4.1: State-wise Flood Forecasting Stations of CWC**

**(as on 31.03.2022)**

| Sl. No. | Name of State/UT | Number of Flood Forecasting Stations | | |
|---|---|---|---|---|
| | | Level | Inflow | Total |
| 1 | 2 | 3 | 4 | 5 |
| 1 | Andhra Pradesh | 10 | 10 | 20 |
| 2 | Arunachal Pradesh | 3 | 0 | 3 |
| 3 | Assam | 30 | 0 | 30 |
| 4 | Bihar | 40 | 3 | 43 |
| 5 | Chhattisgarh | 1 | 2 | 3 |
| 6 | Gujarat | 6 | 7 | 13 |
| 7 | Haryana | 1 | 1 | 2 |
| 8 | Himachal Pradesh | 1 | 0 | 1 |
| 9 | Jammu & Kashmir* | 3 | 0 | 3 |
| 10 | Jharkhand | 2 | 15 | 17 |
| 11 | Karnataka | 1 | 14 | 15 |
| 12 | Kerala | 3 | 2 | 5 |
| 13 | Madhya Pradesh | 2 | 12 | 14 |
| 14 | Maharashtra | 8 | 14 | 22 |
| 15 | Odisha | 12 | 7 | 19 |
| 16 | Rajasthan | 4 | 10 | 14 |
| 17 | Sikkim | 3 | 5 | 8 |
| 18 | Tamil Nadu | 4 | 11 | 15 |
| 19 | Telangana | 5 | 8 | 13 |
| 20 | Tripura | 2 | 0 | 2 |

**Contd…**

**Table 4.1: State-wise Flood Forecasting Stations of CWC**

**(as on 31.03.2022)**

| Sl. No. | Name of State/UT | Number of Flood Forecasting Stations | | |
|---|---|---|---|---|
| | | Level | Inflow | Total |
| 1 | 2 | 3 | 4 | 5 |
| 21 | Uttar Pradesh | 39 | 5 | 44 |
| 22 | Uttarakhand | 4 | 2 | 6 |
| 23 | West Bengal | 12 | 4 | 16 |
| 24 | Daman & Diu* | 1 | 0 | 1 |
| 25 | NCT of Delhi | 2 | 0 | 2 |
| **Total** | | **199** | **132** | **331** |

Source: FFM Directorate, Central Water Commission, M/o Jal Shakti

Note: '*': Union Territory

**Table 4.2: Basin-wise Flood Forecasting Stations of CWC**

**(as on 31.03.2022)**

| Sl. No. | Major Interstate River Systems | FF Stations as on Date | | |
|---|---|---|---|---|
| | | Level | Inflow | Total |
| 1 | 2 | 3 | 4 | 5 |
| 1 | Indus and its tributaries | 3 | 0 | 3 |
| 2 | Ganga & its tributaries | 96 | 39 | 135 |
| 3 | Brahmaputra & its tributaries | 39 | 5 | 44 |
| 4 | Barak System | 6 | 0 | 6 |
| 5 | Subarnarekha (i/c Burhabalang) | 4 | 3 | 7 |
| 6 | Brahmani & Baitarni | 3 | 2 | 5 |
| 7 | East Flowing (Mahanadi to Pennar) | 4 | 4 | 8 |
| 8 | Narmada | 4 | 6 | 10 |
| 9 | Tapi | 1 | 2 | 3 |
| 10 | Mahi | 1 | 4 | 5 |
| 11 | Sabarmati | 1 | 1 | 2 |
| 12 | Mahanadi | 3 | 3 | 6 |
| 13 | Godavari | 18 | 24 | 42 |
| 14 | Krishna | 5 | 19 | 24 |
| 15 | West Flowing Rivers (Kutch & Saurashtra) | 1 | 1 | 2 |
| 16 | West Flowing Rivers (Tapi to Tadri)) | 2 | 1 | 3 |
| 17 | Cauvery and its tributaries | 3 | 9 | 12 |
| 18 | Pennar | 1 | 1 | 2 |
| 19 | East Flowing Rivers (Pennar to Kanyakumari) | 1 | 6 | 7 |
| 20 | West Flowing Rivers (Tadri to Kanyakumari) | 3 | 2 | 5 |
| **Total** | | **199** | **132** | **331** |

Source: FFM Directorate, Central Water Commission, M/o Jal Shakti

**Table 4.3: Flood Forecasting Performance from 2000 to 2022**

| Sl. No. | Year | No. of Level Forecasts Issued | | | No. of Inflow Forecasts Issued | | | Total No. of Forecasts Issued | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Within +/-15 cm of Deviation from Actual | Accuracy (%) | Total | Within +/-20% cumec of Deviation from Actual | Accuracy (%) | Total | Within +/-15 cm or +/-20% cumec of Deviation from Actual | Accuracy (%) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | 2000 | 5622 | 5504 | 97.90 | 821 | 747 | 90.99 | 6443 | 6251 | 97.02 |
| 2 | 2001 | 4606 | 4533 | 98.42 | 857 | 809 | 94.40 | 5463 | 5342 | 97.79 |
| 3 | 2002 | 3618 | 3549 | 98.09 | 623 | 602 | 96.63 | 4241 | 4151 | 97.88 |
| 4 | 2003 | 5989 | 5789 | 96.66 | 611 | 586 | 95.91 | 6600 | 6375 | 96.59 |
| 5 | 2004 | 4184 | 4042 | 96.61 | 705 | 654 | 92.77 | 4889 | 4696 | 96.05 |
| 6 | 2005 | 4323 | 4162 | 96.28 | 1295 | 1261 | 97.37 | 5618 | 5423 | 96.53 |
| 7 | 2006 | 5070 | 4827 | 95.21 | 1593 | 1550 | 97.30 | 6663 | 6377 | 95.71 |
| 8 | 2007 | 6516 | 6339 | 97.28 | 1707 | 1651 | 96.72 | 8223 | 7990 | 97.17 |
| 9 | 2008 | 5670 | 5551 | 97.90 | 1021 | 1003 | 98.24 | 6691 | 6554 | 97.95 |
| 10 | 2009 | 3343 | 3298 | 98.65 | 667 | 629 | 94.30 | 4010 | 3927 | 97.93 |
| 11 | 2010 | 6491 | 6390 | 98.44 | 1028 | 988 | 96.11 | 7519 | 7378 | 98.12 |
| 12 | 2011 | 4848 | 4795 | 98.91 | 1143 | 1109 | 97.03 | 5991 | 5904 | 98.55 |
| 13 | 2012 | 4200 | 4136 | 98.47 | 831 | 803 | 96.63 | 5031 | 4939 | 98.17 |
| 14 | 2013 | 5741 | 5471 | 95.30 | 1319 | 1289 | 97.73 | 7060 | 6760 | 95.75 |
| 15 | 2014 | 3884 | 3804 | 97.94 | 888 | 863 | 97.18 | 4772 | 4667 | 97.80 |
| 16 | 2015 | 3500 | 3429 | 97.97 | 572 | 562 | 98.25 | 4072 | 3991 | 98.01 |
| 17 | 2016 | 4969 | 4891 | 98.43 | 1270 | 1057 | 83.23 | 6239 | 5948 | 95.34 |
| 18 | 2017 | 5085 | 4975 | 97.84 | 1212 | 926 | 76.40 | 6297 | 5901 | 93.71 |
| 19 | 2018 | 4969 | 4871 | 98.03 | 1882 | 1624 | 86.29 | 6851 | 6495 | 94.80 |
| 20 | 2019 | 6004 | 5773 | 96.15 | 3750 | 2678 | 71.41 | 9754 | 8451 | 86.64 |
| 21 | 2020 | 8243 | 8133 | 98.67 | 3478 | 3065 | 88.13 | 11721 | 11198 | 95.54 |
| 22 | 2021 | 6670 | 6456 | 96.79 | 3947 | 3520 | 89.18 | 10617 | 9976 | 93.96 |
| 23 | 2022 | 6779 | 6476 | 95.53 | 4779 | 4369 | 91.42 | 11558 | 10845 | 93.83 |
| **Average** | | **5231** | **5095** | **97.40** | **1565** | **1406** | **89.84** | **6797** | **6502** | **95.66** |

Source: FFM Directorate, Central Water Commission, M/o Jal Shakti

**Figure-7: Flood Forecast Performance (from 2000 to 2022)**

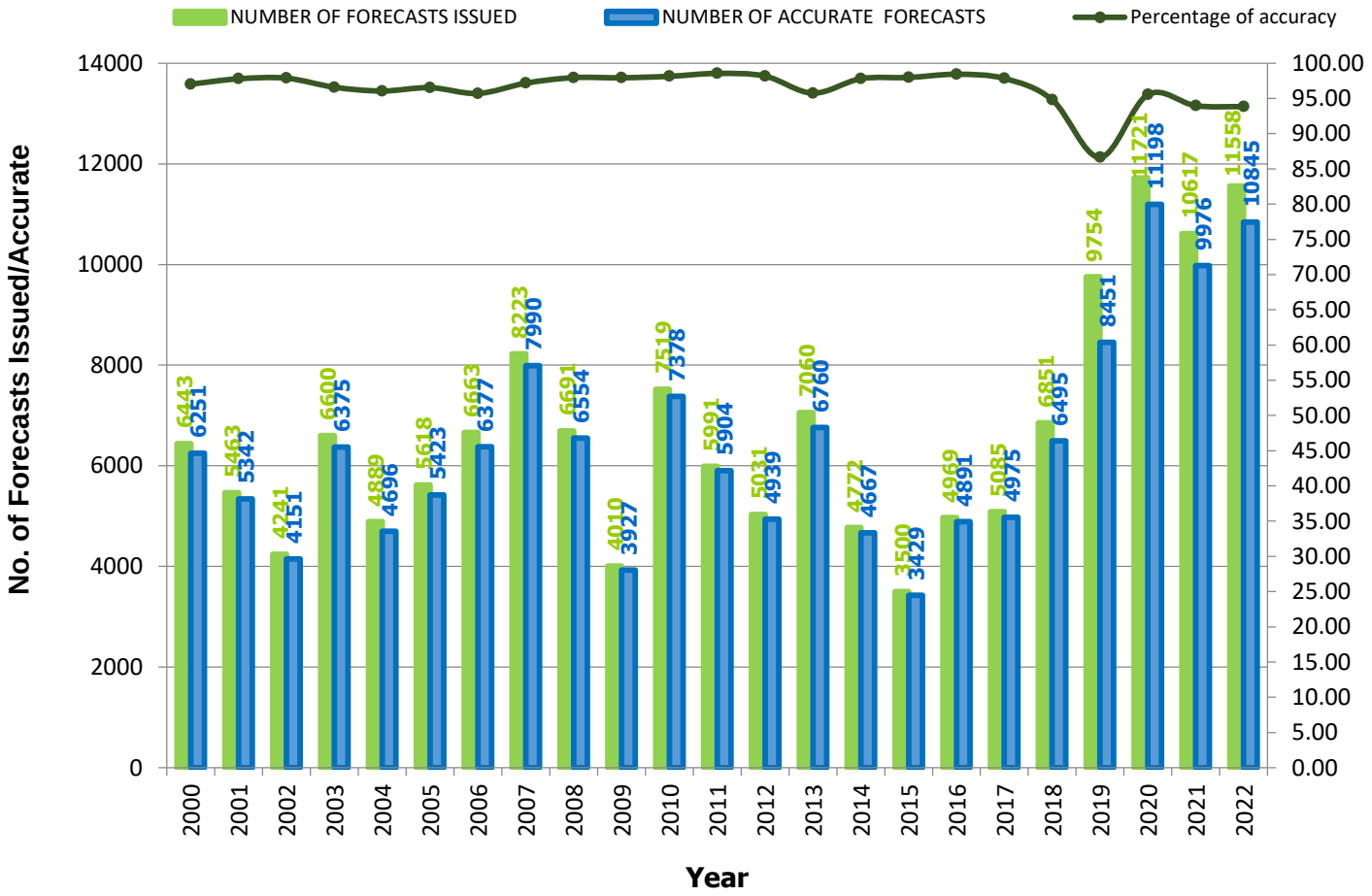


**Table 4.4: Flood Damage during 2011 to 2021**

| Sl. No. | Year | Area Affected in Mha | Population Affected in Million | Damage to Crops | | Damage to Houses | | Cattle Lost No. | Human Lives Lost No. | Damage to Public Utilities in Rs. Cr | Total Damages to Crops, Houses & Public Utilities in Rs. Cr (Col.6+ Col.8+ Col.11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Area in Mha | Value in Rs. Cr | Nos. | Value in Rs. Cr | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1 | 2011 | 1.90 | 15.97 | 2.72 | 1393.85 | 1152518 | 410.48 | 35982 | 1761 | 6053.57 | 7857.89 |
| 2 | 2012 | 2.14 | 14.69 | 1.95 | 1534.11 | 174526 | 240.57 | 31558 | 933 | 9169.97 | 10944.65 |
| 3 | 2013 | 7.55 | 25.93 | 7.48 | 6378.08 | 699525 | 2032.83 | 163958 | 2180 | 38937.84 | 47348.75 |
| 4 | 2014 | 12.78 | 26.51 | 8.01 | 7255.15 | 311325 | 581.98 | 60196 | 1968 | 7710.95 | 15548.08 |
| 5 | 2015 | 4.48 | 33.20 | 3.37 | 17043.95 | 3959191 | 8046.97 | 45597 | 1420 | 32200.18 | 57291.10 |
| 6 | 2016 | 7.06 | 26.55 | 6.66 | 4052.72 | 278240 | 114.68 | 22367 | 1420 | 1507.93 | 5675.33 |
| 7 | 2017 | 6.07 | 47.34 | 4.97 | 8951.98 | 1252914 | 9384.02 | 26673 | 2063 | 12329.85 | 30665.85 |
| 8 | 2018 | 7.72 | 37.40 | 2.51 | 3708.19 | 913414 | 2508.66 | 60279 | 1839 | 12132.92 | 18349.76 |
| 9 | 2019 | 11.60 | 46.35 | 10.69 | 10902.35 | 656595 | 462.79 | 25852 | 2754 | 4498.39 | 15863.53 |
| 10 | 2020 | 6.90 | 26.79 | 6.55 | 5626.02 | 239539 | 272.10 | 46911 | 1474 | 5458.01 | 11356.13 |
| 11 | 2021 | 16.75 | 38.56 | 7.40 | 29229.71 | 461205 | 3960.08 | 64880 | 1371 | 25243.61 | 58433.40 |
| **Total** | | **84.94** | **339.29** | **62.31** | **96076.10** | **10098992** | **28015.14** | **584253** | **19183** | **155243.22** | **279334.46** |
| **Avg.** | | **7.72** | **30.84** | **5.66** | **8734.19** | **918090** | **2546.83** | **53114** | **1744** | **14113.02** | **25394.04** |
| **Max.** | | **16.75** | **47.34** | **10.69** | **29229.71** | **3959191** | **9384.02** | **163958** | **2754** | **38937.84** | **58433.40** |
| **(Year)** | | **2021** | **2017** | **2019** | **2021** | **2015** | **2017** | **2013** | **2019** | **2013** | **2021** |

Source: FM-II Directorate, Central Water Commission, M/o Jal Shakti (as per the latest availability of data)

## 4.1 Flood Management Programme (FMP)

i. To strengthen the structural measures for flood management in the country, Flood Management Programme (FMP), a State Sector scheme amounting to Rs. 8,000 Cr under Central Plan proposed by erstwhile M/o WR, RD&GR, was approved by Government of India during XI Plan (Nov., 2007). The continuation of Flood Management Programme, was approved by the Government of India during XII Plan with an outlay of Rs. 10,000 Cr.

ii. Total 522 schemes costing Rs.13238.36 Cr were approved during XI Plan (420 projects costing Rs. 7857.08 Cr) and XII Plan (102 projects costing Rs. 5381.28 Cr). Out of these 522 schemes, 427 schemes have been completed; 64 schemes are foreclosed, dropped and shifted (47-foreclosed; 16-dropped & 1 shifted to RMBA component) and 31 schemes are ongoing. These 427 completed schemes have given protection to an area of around 4.99 Mha and protected a population of about 53.57 Million.

iii. 5 schemes costing Rs. 2403.24 Cr (1 each from J&K, Himachal Pradesh, Assam, Manipur & Bihar) have been included under FMP component of FMBAP: 2021-26 till FY 2021-22.

iv. Total Central Assistance of Rs. 4873.07 Cr (Rs. 3566.00 Cr during XI Plan & Rs. 1307.07 Cr during XII Plan was released to States/UTs during XI Plan and XII Plan) under Flood Management Programme (FMP) scheme.

**Table 4.5: State-wise approved schemes and completed/foreclosed/ongoing schemes & fund released under Flood Management Programme (FMP) since start of XI Plan (Rs. in Cr) till FY 2021-22**

| Sl. No. | State | XI Plan (Schemes Approved) | XII Plan (Schemes Approved) | Total (XI+XII Plan) | | | | FMBAP 2021-26 (till FY2021-22) | Total schemes approved since XI Plan till FY 2021-22 | Total Central fund released since XI Plan till FY 2021-22 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Nos. | Nos. | Schemes Approved (No.) | Schemes Completed (Nos.) | Schemes shifted/ Foreclosed (Nos.) | Schemes Ongoing (Nos.) | Schemes Approved (No.) | (Nos.) | (Rs. In Cr) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | Arunachal Pradesh | 21 | 0 | 21 | 21 | 0 | 0 | 0 | 21 | 190.78 |
| 2 | Assam | 100 | 41 | 141 | 111 | 30 | 0 | 1 | 142 | 1301.19 |
| 3 | Bihar | 43 | 4 | 47 | 42 | 1 | 4 | 1 | 48 | 924.40 |
| 4 | Chhattisgarh | 3 | 0 | 3 | 3 | 0 | 0 | | 3 | 19.32 |
| 5 | Goa | 2 | 0 | 2 | 2 | 0 | 0 | | 2 | 11.98 |
| 6 | Gujarat | 2 | 0 | 2 | 2 | 0 | 0 | | 2 | 2.00 |
| 7 | Haryana | 1 | 0 | 1 | 1 | 0 | 0 | | 1 | 46.91 |

**Contd…**

**Table 4.5: State-wise approved schemes and completed/foreclosed/ongoing schemes & fund released under Flood Management Programme (FMP) since start of XI Plan (Rs. in Cr) till FY 2021-22**

| Sl. No. | State | XI Plan (Schemes Approved) | XII Plan (Schemes Approved) | Total (XI+XII Plan) | | | | FMBAP 2021-26 (till FY2021-22) | Total schemes approved since XI Plan till FY 2021-22 | Total Central fund released since XI Plan till FY 2021-22 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Nos. | Nos. | Schemes Approved (No.) | Schemes Completed (Nos.) | Schemes shifted/ Foreclosed (Nos.) | Schemes Ongoing (Nos.) | Schemes Approved (No.) | (Nos.) | (Rs. In Cr) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 8 | Himachal Pradesh | 3 | 4 | 7 | 6 | 1 | 0 | 1 | 8 | 832.57 |
| 9 | Jammu & Kashmir | 28 | 15 | 43 | 24 | 3 | 16 | 1 | 44 | 804.79 |
| 10 | Jharkhand | 3 | 0 | 3 | 3 | | 0 | | 3 | 22.71 |
| 11 | Karnataka | 3 | 0 | 3 | 2 | 1 | 0 | | 3 | 23.80 |
| 12 | Kerala | 4 | 0 | 4 | 2 | 2 | 0 | | 4 | 137.95 |
| 13 | Manipur | 22 | 0 | 22 | 22 | | 0 | 1 | 23 | 143.08 |
| 14 | Meghalaya | 0 | 0 | 0 | 0 | | 0 | | 0 | 3.81 |
| 15 | Mizoram | 2 | 0 | 2 | 1 | 1 | 0 | | 2 | 16.88 |
| 16 | Nagaland | 11 | 6 | 17 | 14 | | 3 | | 17 | 93.97 |
| 17 | Odisha | 67 | 1 | 68 | 66 | 2 | 0 | | 68 | 119.42 |
| 18 | Puducherry* | 1 | 0 | 1 | 0 | 1 | 0 | | 1 | 7.50 |
| 19 | Punjab | 5 | 0 | 5 | 4 | 1 | 0 | | 5 | 40.43 |
| 20 | Sikkim | 28 | 17 | 45 | 28 | 17 | 0 | | 45 | 91.84 |
| 21 | Tamil Nadu | 5 | 0 | 5 | 5 | | 0 | | 5 | 59.82 |
| 22 | Tripura | 11 | 0 | 11 | 11 | | 0 | | 11 | 23.62 |
| 23 | Uttar Pradesh | 26 | 3 | 29 | 24 | 2 | 3 | | 29 | 470.19 |
| 24 | Uttarakhand | 12 | 10 | 22 | 18 | 2 | 2 | | 22 | 246.59 |
| 25 | West Bengal | 17 | 1 | 18 | 15 | | 3 | | 18 | 1051.96 |
| **Total** | | **420** | **102** | **522** | **427** | **64** | **31** | **5** | **527** | **6687.50** |

Source: FMP Directorate, Central Water Commission, M/o Jal Shakti

Note: '*': The scheme has been shifted to be funded under RMBA component.

### 4.2 River Management Activities & Works related to Border Areas (RMBA) Component

i. This started as a Central Sector Scheme with an outlay of Rs. 820 Cr in XI plan for taking up non-structural measures such as Hydrological Observation and Flood Forecasting works on common border rivers, payment to neighbouring countries (China) for supplying HO data on common rivers, investigation of WR projects in neighbouring countries, activities of GFCC and Pancheshwar Development Authority (PDA) was funded through this scheme. In addition to above activities, 100% Central Assistance was also provided for taking up structural measures such as Anti Erosion/Flood Management schemes on rivers on international borders and Union Territories. The continuation of River Management Activities & Works related to Border Areas (RMBA), was approved by the Government of India during XII Plan with an outlay of Rs 740 Cr.

ii. Total Central Assistance (as Grant-in-Aid) of Rs. 563.61 Cr (Rs. 340.41 Cr during XI Plan & Rs. 223.20 Cr during XII Plan) was released during XI Plan and XII Plan.

### 4.3 Flood Management and Border Areas Programme (FMBAP)

i. **(FMBAP) 2017-21:** In continuation of Flood Management Programme (FMP), a comprehensive scheme titled 'Flood Management and Border Areas Programme (FMBAP) for period 2017-20' with an outlay of Rs 3342.00 Cr (FMP-Rs. 2642 Cr & RMBA-Rs. 700 Cr) with merged components from the existing Flood Management Programme (FMP) and River Management Activities & Works related to Border Areas (RMBA) schemes during XII Five Year Plan was approved by the Union Cabinet on 7th March, 2019 with the aim for completion of the on-going projects, which were already approved under FMP scheme. The scheme was extended till March, 2021.

ii. **(FMBAP) 2021-26**: The total amount recommended by EFC for FMBAP 2021-26 for XVth Finance Commission Cycle is Rs. 4,500 Cr. Approval of FMBAP 2021-2026 vide Cabinet decision dated 19.01.2022 is up to September, 2022 with limited outlay of Rs. 450 Cr. Funding ratio has been kept as 90:10 (for special category States) and 60:40 (for general States) under FMP component of FMBAP scheme. 5 schemes (1 scheme each from J&K, Himachal Pradesh, Assam, Manipur and Bihar) have been included under FMP component of FMBAP: 2021-26 till end of FY 2021-22. The release under the FMP as well as RMBA is as under:

**(Rs. in Cr)**

| Sl. No. | Component | XI Plan | XII Plan | Total during (XI+XII) | Total FMBAP 2017-21 | FMBAP 2021-26 FY: 2021-22 | Total Fund Released since XI plan till FY 2021-22 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | FMP | 3566.00 | 1307.07 | 4873.07 | 1574.68 | 239.75 | 6687.50 |
| 2 | RMBA (Grant-in-Aid) | 340.41 | 223.20 | 563.61 | 527.83 | 3.74 | 1095.18 |
| **Total** | | **3906.41** | **1530.27** | **5436.68** | **2102.51** | **243.49** | **7782.68** |

Source: FMP Directorate, Central Water Commission, M/o Jal Shakti

### 4.4 Distribution of Revenue and Capital Expenditure incurred by Sub-Major Head of Accounts

The Tables 4.6 and 4.7 show the distribution of revenue and capital expenditure incurred by sub-major heads of accounts for flood control, anti-sea erosion, drainage and general purposes in India from 2005-06 to 2019-20 respectively, where:

i. Flood Control (01) Head: covers sub minor heads- Direction and administration (001), Construction (051), Machinery and Equipment (052), Civil Works (103), Investments in Public Sector and other Undertaking (190), Special Component Plan for Scheduled Castes(789), Tribal Area Sub-Plan (796), Suspense(799), Other Expenditure (800) and Deduct-Recoveries of Overpayment (911);

ii. Anti-Sea Erosion Projects(02) Head: covers sub minor heads- Direction and administration (001), Civil Works(103), Special Component Plan for Scheduled Castes (789), Other Expenditure (800) and Deduct-Recoveries of Overpayment (911);

iii. Drainage (03) Head: covers sub minor heads- Direction & Administration(001), Machinery and Equipment (052), Civil Works (103), Special Component Plan for Scheduled Caste (789), Suspense (799), Other Expenditure (800) and Deduct-Recoveries of Overpayments(911) and

iv. General (80) Head: covers sub minor head- Deduct-Recoveries of Overpayments (911).

**Table 4.6: Distribution of Revenue Expenditure incurred by Sub-Major Head of Accounts during 2005-2020**

**(Rs. in Cr)**

| Sl. No. | Year | Flood Control (01) | Anti-Sea Erosion (02) | Drainage (03) | General (80) | Total (99) |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2005-06 | 479.51 | 18.64 | 193.15 | 2.11 | 693.41 |
| 2 | 2006-07 | 535.69 | 11.98 | 196.34 | 3.05 | 747.05 |
| 3 | 2007-08 | 553.47 | 21.93 | 144.82 | 0.52 | 720.74 |
| 4 | 2008-09 | 781.67 | 27.55 | 254.32 | 0.41 | 1063.95 |
| 5 | 2009-10 | 840.33 | 28.89 | 291.74 | 0.32 | 1161.28 |
| 6 | 2010-11 | 956.65 | 31.46 | 313.45 | 0.37 | 1301.93 |
| 7 | 2011-12 | 1250.57 | 45.05 | 287.94 | 0.88 | 1584.44 |
| 8 | 2012-13 | 1338.74 | 83.05 | 368.72 | 0.60 | 1791.10 |
| 9 | 2013-14 | 1473.99 | 54.39 | 315.72 | 1.86 | 1845.97 |
| 10 | 2014-15 | 1587.99 | 54.50 | 334.34 | 0.78 | 1977.61 |
| 11 | 2015-16 | 1565.19 | 56.93 | 228.38 | 0.59 | 1851.09 |
| 12 | 2016-17 | 1712.11 | 54.02 | 232.46 | 0.00 | 1998.59 |
| 13 | 2017-18 | 2091.27 | 54.23 | 215.22 | 0.35 | 2361.07 |
| 14 | 2018-19 | 2048.40 | 39.33 | 257.19 | 0.00 | 2344.92 |
| 15 | 2019-20 | 1857.14 | 40.00 | 364.65 | 0.00 | 2261.79 |
| **Total** | | **19072.73** | **621.93** | **3998.45** | **11.84** | **23704.95** |

Source: Combined Finance and Revenue Accounts-Union & State by Comptroller and Auditor General of India (CAG) (as per the latest availability of data)
(https://cag.gov.in/en/combined-accounts?arch=1, https://cag.gov.in/en/combined-accounts)

**Table 4.7: Distribution of Capital Expenditure incurred by Sub-Major Head of Accounts during 2005-2020**

**(Rs. in Cr)**

| Sl. No. | Year | Flood Control (01) | Anti-Sea Erosion (02) | Drainage (03) | General (80) | Total (99) |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | 2005-06 | 727.52 | 62.87 | 288.42 | 0.00 | 1078.81 |
| 2 | 2006-07 | 976.33 | 71.80 | 247.62 | 0.00 | 1295.75 |
| 3 | 2007-08 | 1369.46 | 107.80 | 264.38 | 0.00 | 1741.63 |
| 4 | 2008-09 | 2007.18 | 188.99 | 313.39 | 0.00 | 2509.56 |
| 5 | 2009-10 | 2760.22 | 224.23 | 338.82 | 0.00 | 3323.27 |
| 6 | 2010-11 | 3161.58 | 160.97 | 234.41 | 0.00 | 3556.96 |
| 7 | 2011-12 | 3995.36 | 48.24 | 286.52 | 0.00 | 4330.12 |
| 8 | 2012-13 | 3623.44 | 114.92 | 431.91 | 0.00 | 4170.27 |
| 9 | 2013-14 | 3309.24 | 148.98 | 369.21 | 0.00 | 3827.43 |
| 10 | 2014-15 | 4781.12 | 131.35 | 510.95 | 0.00 | 5423.43 |
| 11 | 2015-16 | 4535.14 | 129.62 | 616.72 | 0.00 | 5281.49 |
| 12 | 2016-17 | 5480.82 | 127.22 | 855.17 | 0.00 | 6463.21 |
| 13 | 2017-18 | 4912.64 | 168.50 | 629.12 | 0.00 | 5710.26 |
| 14 | 2018-19 | 5297.92 | 94.84 | 619.48 | 0.00 | 6012.24 |
| 15 | 2019-20 | 4046.91 | 103.90 | 685.20 | 0.00 | 4836.02 |
| **Total** | | **50984.88** | **1884.24** | **6691.32** | **0.00** | **59560.43** |

Source: Combined Finance and Revenue Accounts-Union & State by Comptroller and Auditor General of India (CAG) (as per the latest availability of data)
(https://cag.gov.in/en/combined-accounts?arch=1, https://cag.gov.in/en/combined-accounts)

*******

# Section-V
# Land Use Statistics

i. In India, on the basis of nine-fold land-use classification, the land use statistics is available for roughly 308 Mha of land out of the 329 Mha of the total geographic area which accounts for 93.6% of the total land. Land is an environmental asset that outlines the space in which all the natural processes and human/economic activities are occurring. With growing population and changing industrial profile of economies and consequently, the country's socio-economic priorities drive changes in land use. Land-use change has broad lines of impact with a potential for influencing economic growth, quality of life, management of environmental resources, and national food supply.

ii. Land is required for both agriculture and non-agricultural purposes, including establishment of industries, housing, roads, parks, railway lines etc. Further, due to the rapid industrialization and population growth, land resources are under pressure from physical, human and global causes such as soil erosion, desertification, pollution, food shortage, land conflict, water shortage and climate change. In addition, the urbanization of land has measurable impact on the quantity and quality of water resources.

iii. This Section deals with the data on selected Land-use & Irrigation Statistics, Irrigation area under principal crops, sources of irrigation along with area irrigated and productivity of food grains. It provides information on State/UT-wise Water Rates for Flow and Lift Irrigation.

**Table 5.1: Year-wise Net Area Sown, Net Irrigated Area and Net Un-Irrigated Area**

**(In Th. Ha)**

| Sl. No. | Year | Net Area Sown | Net Irrigated Area | Net Un-Irrigated Area =Col (3)-Col (4) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 2011-12 | 140792 | 66009 | 74783 |
| 2 | 2012-13 | 139746 | 66589 | 73157 |
| 3 | 2013-14 | 141238 | 68419 | 72819 |
| 4 | 2014-15 | 139445 | 68582 | 70863 |
| 5 | 2015-16 | 138974 | 67772 | 71202 |
| 6 | 2016-17 | 139000 | 69270 | 69730 |
| 7 | 2017-18 | 138770 | 70164 | 68606 |
| 8 | 2018-19 | 138439 | 72244 | 66195 |
| 9 | 2019-20 | 139901 | 75469 | 64433 |
| 10 | 2020-21 | 141544 | 77729 | 63815 |
| 11 | 2021-22 | 141007 | 77916 | 63091 |

Source: 'Land Use Statistics at a Glance 2011-12 to 2021-22', Economics Statistics & Evaluation Division, D/o Agriculture & Farmers Welfare, M/o Agriculture & Farmers Welfare

**Figure-8: Net Area Sown , Net Irrigated Area and Net Un-Irrigated Area**

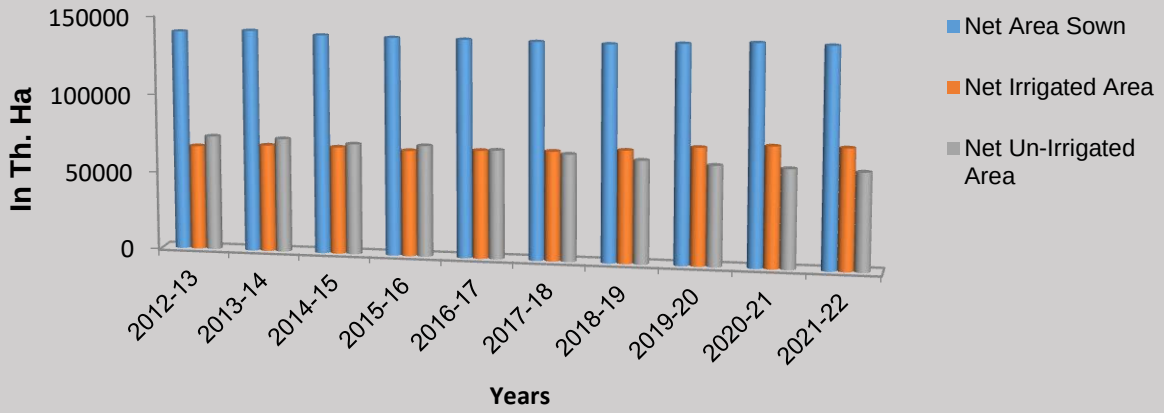



**Table 5.2: Year-wise Gross Area Sown, Gross Irrigated Area and Gross Un-Irrigated Area**

**(In Th. Ha)**

| Sl. No. | Year | Gross Area Sown (Total Cropped Area) | Gross Irrigated Area | Gross Un-Irrigated Area =Col (3)-Col (4) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 2011-12 | 195546 | 91931 | 103614 |
| 2 | 2012-13 | 194455 | 92780 | 101675 |
| 3 | 2013-14 | 201300 | 96270 | 105030 |
| 4 | 2014-15 | 198285 | 97846 | 100439 |
| 5 | 2015-16 | 198122 | 97754 | 100368 |
| 6 | 2016-17 | 201158 | 99620 | 101538 |
| 7 | 2017-18 | 200876 | 101467 | 99409 |
| 8 | 2018-19 | 201179 | 104711 | 96469 |
| 9 | 2019-20 | 211359 | 112443 | 98916 |
| 10 | 2020-21 | 216107 | 118934 | 97173 |
| 11 | 2021-22 | 219158 | 120380 | 98778 |

Source: 'Land Use Statistics at a Glance 2011-12 to 2021-22', Economics Statistics & Evaluation Division, D/o Agriculture & Farmers Welfare, M/o Agriculture & Farmers Welfare

**Figure-9: Gross Area Sown, Gross Irrigated Area and Gross Un-irrigated Area**

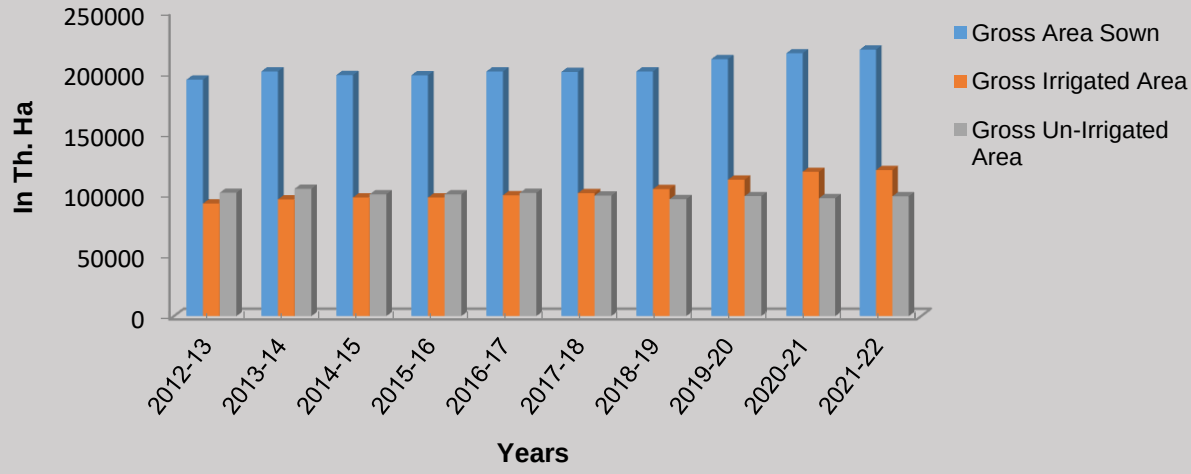


**Table 5.3: Total Cultivable Land and Cropping Intensity**

**(In Th. Ha)**

| Sl. No. | Year | Cultivated Land | Net Area Sown | Gross Irrigated Area | % of Gross Irrigated Area to Total Cropped Area =[Col (5)/Col (7)]*100 | Gross Area Sown (Total Cropped Area) | Cropping Intensity (%) =[Col (7)/Col (4)]*100 |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | 2011-12 | 155451 | 140792 | 91931 | 47.0 | 195546 | 138.9 |
| 2 | 2012-13 | 155185 | 139746 | 92780 | 47.7 | 194455 | 139.1 |
| 3 | 2013-14 | 155542 | 141238 | 96270 | 47.8 | 201300 | 142.5 |
| 4 | 2014-15 | 154520 | 139445 | 97846 | 49.3 | 198285 | 142.2 |
| 5 | 2015-16 | 154685 | 138974 | 97754 | 49.3 | 198122 | 142.6 |
| 6 | 2016-17 | 154298 | 139000 | 99620 | 49.5 | 201158 | 144.7 |
| 7 | 2017-18 | 153759 | 138770 | 101467 | 50.5 | 200876 | 144.8 |
| 8 | 2018-19 | 153653 | 138439 | 104711 | 52.0 | 201179 | 145.3 |
| 9 | 2019-20 | 153671 | 139901 | 112443 | 53.2 | 211359 | 151.1 |
| 10 | 2020-21 | 154530 | 141544 | 118934 | 55.0 | 216107 | 152.7 |
| 11 | 2021-22 | 154262 | 141007 | 120380 | 54.9 | 219158 | 155.4 |

Source: ‘Land Use Statistics at a Glance 2011-12 to 2021-22’, Economics Statistics & Evaluation Division, D/o Agriculture & Farmers Welfare, M/o Agriculture & Farmers Welfare

Note: ‘Cropping Intensity’: It is the percentage of the ‘Gross Cropped Area’ to ‘Net Area Sown’.

**Table 5.4: Agriculture Land by use in India**

**(In Th. Ha)**

| Sl. No. | Classification | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **I.** | **Geographical Area** | 328726 | 328726 | 328726 | 328726 | 328726 | 328726 | 328726 | 328726 | 328747 | 328747 | 328747 |
| **II.** | **Reporting Area for Land Utilisation Statistics (1 to 5)** | 307134 | 307232 | 307538 | 307523 | 307493 | 308058 | 307509 | 307528 | 306542 | 306982 | 306486 |
| 1 | Forests | 71618 | 71590 | 71848 | 72071 | 72137 | 72295 | 72334 | 72295 | 71751 | 71980 | 72000 |
| 2 | Not Available for Cultivation (A+B) | 43335 | 43382 | 43664 | 43985 | 43771 | 44550 | 44067 | 44282 | 44319 | 44409 | 44093 |
| (A) | Area Under Non-agricultural Uses | 26355 | 26549 | 26958 | 27146 | 27270 | 28042 | 27557 | 27589 | 27777 | 27726 | 27578 |
| (B) | Barren & Un-culturable Land | 16980 | 16833 | 16706 | 16839 | 16502 | 16507 | 16510 | 16693 | 16542 | 16684 | 16515 |
| 3 | Other Uncultivated land excluding Fallow Land (A+B+C) | 26061 | 26034 | 25787 | 25854 | 25590 | 25628 | 25709 | 25645 | 25559 | 25244 | 25214 |
| (A) | Permanent Pasture & other Grazing Land | 10264 | 10211 | 10215 | 10199 | 10214 | 10291 | 10291 | 10328 | 10480 | 10327 | 10281 |
| (B) | Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown | 3160 | 3181 | 3186 | 3103 | 3092 | 3125 | 3169 | 3155 | 3134 | 3012 | 3013 |
| (C) | Culturable Waste Land | 12636 | 12642 | 12386 | 12553 | 12284 | 12211 | 12250 | 12162 | 11945 | 11905 | 11920 |
| 4 | Fallow Lands (A+B) | 25328 | 26480 | 25002 | 26168 | 27021 | 26586 | 26629 | 26868 | 25012 | 23804 | 24172 |
| (A) | Fallow Lands other than Current Fallows | 10669 | 11040 | 10698 | 11093 | 11310 | 11288 | 11640 | 11654 | 11242 | 10818 | 10917 |
| (B) | Current Fallows | 14660 | 15439 | 14304 | 15075 | 15711 | 15298 | 14988 | 15214 | 13770 | 12986 | 13255 |
| 5 | Net Area Sown (6-7) | 140792 | 139746 | 141238 | 139445 | 138974 | 139000 | 138770 | 138439 | 139901 | 141544 | 141007 |
| 6 | Total Cropped Area (Gross Cropped Area) | 195546 | 194455 | 201300 | 198285 | 198122 | 201158 | 200876 | 201179 | 211359 | 216107 | 219158 |
| 7 | Area Sown more than once (6-5) | 54754 | 54709 | 60061 | 58840 | 59148 | 62159 | 62106 | 62740 | 71457 | 74563 | 78152 |
| 8 | Cropping Intensity* | 139 | 139 | 143 | 142 | 143 | 145 | 145 | 145 | 151 | 153 | 155 |
| **III.** | **Net Irrigated Area** | **66009** | **66589** | **68419** | **68582** | **67772** | **69270** | **70164** | **72244** | **75469** | **77729** | **77916** |
| **IV.** | **Gross Irrigated Area** | **91931** | **92780** | **96270** | **97846** | **97754** | **99620** | **101467** | **104711** | **112443** | **118934** | **120380** |

Source: 'Land Use Statistics at a Glance 2011-12 to 2021-22', Economics Statistics & Evaluation Division, D/o Agriculture & Farmers Welfare, M/o Agriculture & Farmers Welfare

Note: 'Cropping Intensity': It is the percentage of the 'Gross Cropped Area' to 'Net Area Sown'.

## 5.1 Irrigated Area under Principal Crops

i. To have an idea about the quantum of water used for irrigation it is important to know the irrigated area under different crops as the requirement of water varies from crop to crop. The gross irrigated area for a few selected crops has been presented in the following Table 5.5:

**Table 5.5: Total Gross Irrigated Area for Crops - All India**

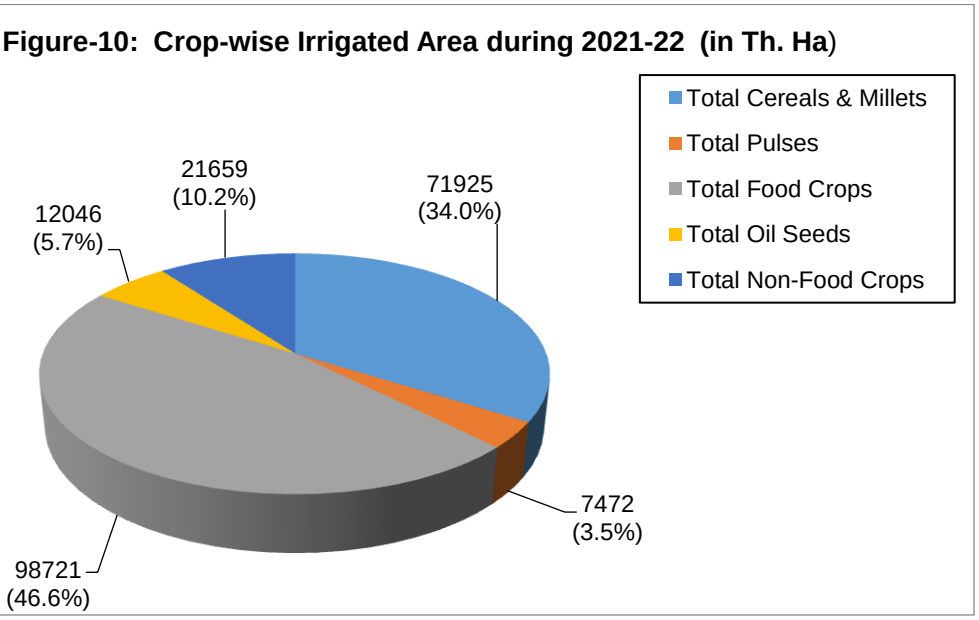
**(Th. Ha)**

| Crop/Year | Rice | Wheat | Total Cereals & Millets | Total Pulses | Total Food Crops | Total Oilseeds | Cotton | Total Non-Food Crops | Total Gross Irrigated Area |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2011-12 | 25579 | 27748 | 57802 | 3849 | 75970 | 7733 | 4252 | 15961 | 91931 |
| 2012-13 | 25006 | 28282 | 57796 | 4172 | 76010 | 8283 | 4171 | 16769 | 92780 |
| 2013-14 | 26519 | 29149 | 60394 | 4765 | 79446 | 8347 | 4010 | 16824 | 96270 |
| 2014-15 | 26614 | 30261 | 61457 | 4345 | 80539 | 7867 | 4484 | 17307 | 97846 |
| 2015-16 | 26204 | 29290 | 59978 | 4471 | 80158 | 8271 | 4132 | 17597 | 97754 |
| 2016-17 | 27067 | 30402 | 62040 | 5074 | 82357 | 8401 | 3972 | 17263 | 99620 |
| 2017-18 | 27721 | 29525 | 61864 | 6561 | 83855 | 8325 | 4537 | 17613 | 101467 |
| 2018-19 | 28599 | 30181 | 62997 | 6515 | 85855 | 8985 | 4853 | 18855 | 104711 |
| 2019-20 | 31265 | 34012 | 70445 | 6100 | 93286 | 9348 | 4977 | 19156 | 112443 |
| 2020-21 | 33634 | 33902 | 73105 | 7297 | 98276 | 10432 | 5024 | 20658 | 118934 |
| 2021-22 | 33718 | 33171 | 71925 | 7472 | 98721 | 12046 | 4605 | 21659 | 120380 |

Source: 'Land Use Statistics at a Glance 2011-12 to 2021-22', Economics Statistics & Evaluation Division, D/o Agriculture & Farmers Welfare, M/o Agriculture & FW

ii. Among the cereals, it is observed that irrigated area under rice varied between 25579 to 33718 Th. Ha during the period 2011-12 to 2021-22. The irrigated area under wheat varies from 27748 to 33171 Th. Ha during the same period. The crop-wise irrigated area during 2021-22 is presented in the following Figure-10. It is observed that the maximum contribution is from Food crops (46.6%), followed by Cereals & Millets (34.0%).

**Figure-10: Crop-wise Irrigated Area during 2021-22 (in Th. Ha)**



## 5.2 Sources of Irrigation and Area Irrigated

i. The main sources of irrigation in the country are canals, tanks and wells including tube-wells. These data are available from two sources. Ministry of Agriculture collects and compiles data on irrigated area by source at various levels - District/State/Country.

ii. The erstwhile Planning Commission also collected data on Irrigation Potential Created (IPC) and Utilised (IPU) for major and medium irrigation projects. For Minor Irrigation schemes, D/o Water Resources, RD and GR, Ministry of Jal Shakti conducts a census on regular interval. These censuses provide IPC and IPU by source of irrigation. 5$^{th}$ MI census was conducted with reference year 2013-14. The report of 5$^{th}$ MI census was published in 2017 and is available on the website of the Department of Water Resources, RD & GR, M/o Jal Shakti. The sixth MI census with reference year 2017-18 is going on.

iii. Analysing the data relating to net area irrigated by source for the year 2021-22, it is observed that the major source of irrigation is ground water. It was found that wells provided about 60.46% irrigation followed by canals with 24.67% at all India level during 2021-22.

**Table 5.6: Source-wise Net Irrigated Area in India**

**(Th. Ha)**

| Year | Canal | Tank | Wells | Other Sources | Total (All Sources) |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) |
| 2011-12 | 16120 | 2007 | 40455 | 7426 | 66009 |
| 2012-13 | 15789 | 1842 | 41224 | 7734 | 66589 |
| 2013-14 | 16395 | 1932 | 42358 | 7734 | 68419 |
| 2014-15 | 16274 | 1883 | 42600 | 7826 | 68582 |
| 2015-16 | 15497 | 1874 | 42886 | 7515 | 67772 |
| 2016-17 | 16817 | 1793 | 42932 | 7727 | 69270 |
| 2017-18 | 16914 | 1813 | 43948 | 7489 | 70164 |
| 2018-19 | 17611 | 1747 | 44947 | 7938 | 72244 |
| 2019-20 | 18543 | 2013 | 46496 | 8416 | 75469 |
| 2020-21 | 18600 | 2190 | 47327 | 9612 | 77729 |
| 2021-22 | 19218 | 2205 | 47105 | 9387 | 77916 |

Source: 'Land Use Statistics at a Glance 2011-12 to 2021-22', Economics Statistics & Evaluation Division, D/o Agriculture & Farmers Welfare, M/o Agriculture & FW

**Table 5.7: Productivity of Food Grains**

| Sl. No. | Year | Area (Mha) | Production (Million Tonne) | Yield (Tonne/Ha) |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 1950-51 | 97.32 | 50.82 | 0.52 |
| 2 | 1960-61 | 115.58 | 82.02 | 0.71 |
| 3 | 1970-71 | 124.32 | 108.42 | 0.87 |
| 4 | 1980-81 | 126.67 | 129.59 | 1.02 |
| 5 | 1990-91 | 127.84 | 176.39 | 1.38 |
| 6 | 2000-01 | 121.05 | 196.81 | 1.63 |
| 7 | 2010-11 | 126.67 | 244.49 | 1.93 |
| 8 | 2011-12 | 124.75 | 259.29 | 2.08 |
| 9 | 2012-13 | 120.78 | 257.13 | 2.13 |
| 10 | 2013-14 | 125.05 | 265.05 | 2.12 |
| 11 | 2014-15 | 124.30 | 252.03 | 2.03 |
| 12 | 2015-16 | 123.22 | 251.54 | 2.04 |
| 13 | 2016-17 | 129.23 | 275.11 | 2.13 |
| 14 | 2017-18 | 127.52 | 285.01 | 2.24 |
| 15 | 2018-19 | 124.78 | 285.21 | 2.29 |
| 16 | 2019-20 | 126.99 | 297.50 | 2.34 |
| 17 | 2020-21 | 129.80 | 310.74 | 2.39 |
| 18 | 2021-22* | 130.53 | 315.72 | 2.42 |

Source: 'Agriculture Statistics at a Glance-2022', Directorate of Economics & Statistics, Department of Agriculture & Farmers Welfare, M/o Agriculture & Farmers Welfare (https://desagri.gov.in/wp-content/uploads/2023/05/Agricultural-Statistics-at-a-Glance-2022.pdf )

Note: '*': 4th Advanced Estimates

**Figure-11: Productivity of Food Grains (Last 5 years)**

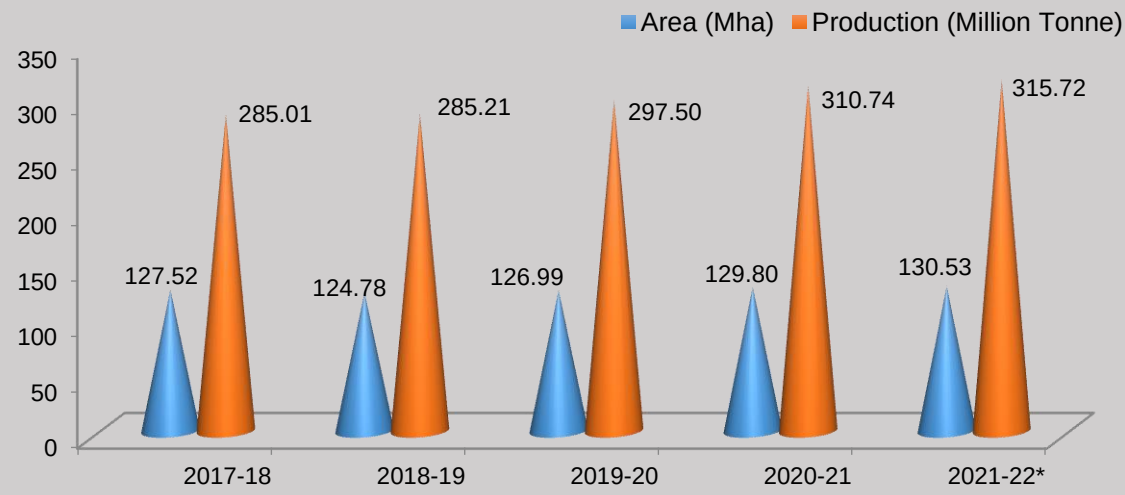


**Table 5.8: State/UT-wise Water Rates for Flow and Lift Irrigation**

**(Unit: Rs./ Ha)**

| State/UT | Flow Irrigation Rates Range | | Lift Irrigation Rates Range | | Date since applicable |
|---|---|---|---|---|---|
| | Max | Min | Max | Min | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| Andhra Pradesh/ Telangana | 864.50 | 148.20 | NA | | 01-07-1996 |
| Arunachal Pradesh | No Water Rates | | | | |
| Assam | 751.00 | 150.00 | 751.00 | 150.00 | 30-03-2000 |
| Bihar | 370.50 | 74.10 | NA | | 27-11-2011 |
| Chhattisgarh | 741.29 | 172.97 | 741.29 | 172.97 | 15-06-1999 |
| Delhi | 148.20 | 34.03 | 148.20 | 33.35 | 2009 |
| Goa | 360.00 | 72.00 | 720.00 | 144.00 | 06-04-2016 |
| Gujarat | 590.59 | 314.19 | 196.86 | 104.73 | 16-06-2021 |
| Haryana | 296.52 | 37.06 | 148.26 | 18.53 | 30-11-2018 |
| Himachal Pradesh | 66.47 | 66.47 | 132.91 | 132.91 | 31-03-2019 |
| Jharkhand | 370.50 | 74.10 | 370.50 | 74.10 | 26-11-2001 |
| Karnataka | 988.39 | 37.06 | 2965.16 | 74.13 | 18-09-2018 |
| Kerala | 99.00 | 37.00 | 148.50 | 93.00 | 18-09-1974 |
| Madhya Pradesh | 960.00 | 50.00 | 960.00 | 50.00 | 31-12-2005 |
| Maharashtra | 13.50 | 3.38 | 10.97 | 0.47 | 11-01-2018 |
| Manipur | 602.00 | 184.00 | 602.00 | 184.00 | 24-08-2013 |
| Meghalaya | No Water Rates | | | | |
| Mizoram | No Water Rates | | | | |
| Nagaland | No Water Rates | | | | |
| Orissa | 930.00 | 60.00 | NA | | 05-04-2002 |
| Punjab | 123.50 | 123.50 | 123.50 | 123.50 | 12-11-2014 |
| Rajasthan | 286.52 | 49.40 | 573.04 | 24.70 | 24-05-1999 |
| Sikkim | 250.00 | 10.00 | NA | | 2002 |
| Tamil Nadu | 61.78 | 2.77 | NA | | 06-11-1987 |
| Tripura | 312.50 | 312.50 | 312.50 | 312.50 | 01-10-2003 |
| Uttarakhand | No Water Rates | | | | |
| Uttar Pradesh | 6148.20 | 192.92 | 3075.08 | 97.44 | 03-09-2014 |
| West Bengal | 123.50 | 37.06 | 2015.52 | 251.94 | 01-07-2003 |
| A & N Islands | No Water Rates | | | | |
| Chandigarh* | NA | | | | |
| Dadra & Nagar Haveli | 830.00 | 110.00 | 275.00 | 75.00 | 29-01-1996 |
| Daman & Diu | 286.00 | 286.00 | 286.00 | 286.00 | 2007 |
| Jammu/ Kashmir/ Ladakh | 523.84 | 212.50 | 2614.28 | 1045.22 | 01-04-2018 |
| Lakshadweep | No Water Rates | | | | |
| Puducherry | NA | | | | |

Source: Department of Irrigation, Water Resource Department and State Government offices.

*In rural areas of Chandigarh, the water rates for irrigation purpose is Rs 23/- per hour, with effect from 01.01.2010.

'NA': Not Available

*******

# Section-VI
# Navigation-Inland Water and Transport

i. India is endowed with a variety of navigable waterways comprising river systems, canals, back waters, creeks and tidal inlets. However, navigation by mechanized crafts is possible only over a limited length covering about half of the reported navigable waterways. Length of waterways along with its navigable length is an indicator of inland water potential of a State.

ii. This Section provides the criteria for declaration of National Waterway, details of National Waterways (1-5) and development of 106 new National Waterways. It also provides the details of cargo movement on the major waterways in the country.

## 6.1 National Waterways

i. Criteria for declaration of National Waterway

(i) It should possess capability of navigation by mechanically propelled vessels of minimum 300 Tonnes (DWT) capacity (45m x 8m x1.2m);

(ii) It should have a fairway of minimum 40m wide channel with 1.4m depth in case of rivers and minimum 30m wide channel with 1.8m depth in case of canals. Exception may be given in case of irrigation-cum-navigation canals based on request of the concerned State Government in order to safeguard the interest of irrigation;

(iii) It should be a continuous stretch of minimum 50 km; the only exception to be made to waterway length is for urban conglomerations and intra-port traffic; and

(iv) It should pass through and serve the interest of more than one States or connect a vast and prosperous hinterland and major port, or either pass through or connect a strategic region where development of navigations is considered necessary to provide logistic support for economic development or national security, or connect place not served by any other mode of transport.

ii. To promote Inland Water Transport (IWT) in the country, the following five waterways had been declared as National Waterways till the enactment of National Waterways Act, 2016 (effective from 12.04.2016):

(i) Allahabad-Haldia stretch (1620 km) of Ganga-Bhagirathi-Hooghly River System was declared National Waterway-1 in 1982 and effective in October, 1986.

(ii) Sadiya-Dhubri stretch (891 km) of the Brahmaputra River was declared National Waterways-2 in September, 1988.

(iii) Kottapuram-Kollam stretch (168 km) of the West Coast Canal along with Champakara canal (14 km) and Udyogmandal canal (23 km) was declared National Waterways-3 in February, 1993 (Total 205 km).

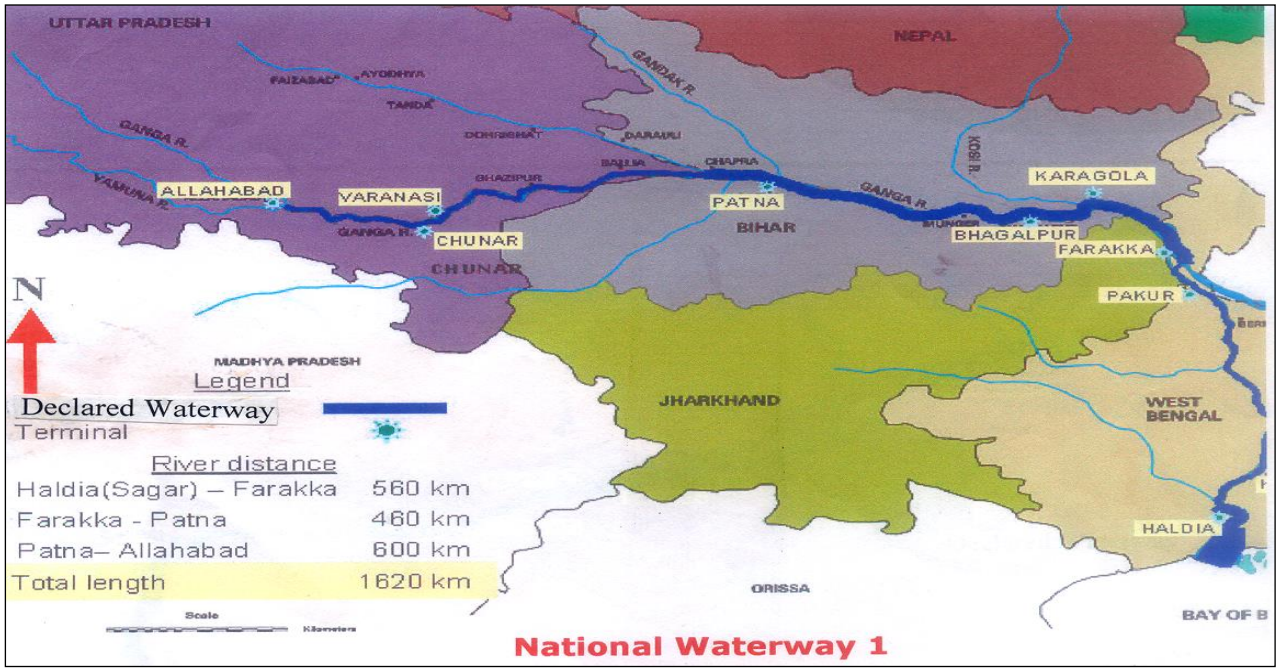
(iv) Kakinada- Puducherry canals along with Godavari and Krishna Rivers (1078 km) as National Waterway-4 in 2008 and

(v) East Coast Canal integrated with Brahmani River and Mahanadi Delta Rivers (588 km) as National Waterway-5 in 2008.

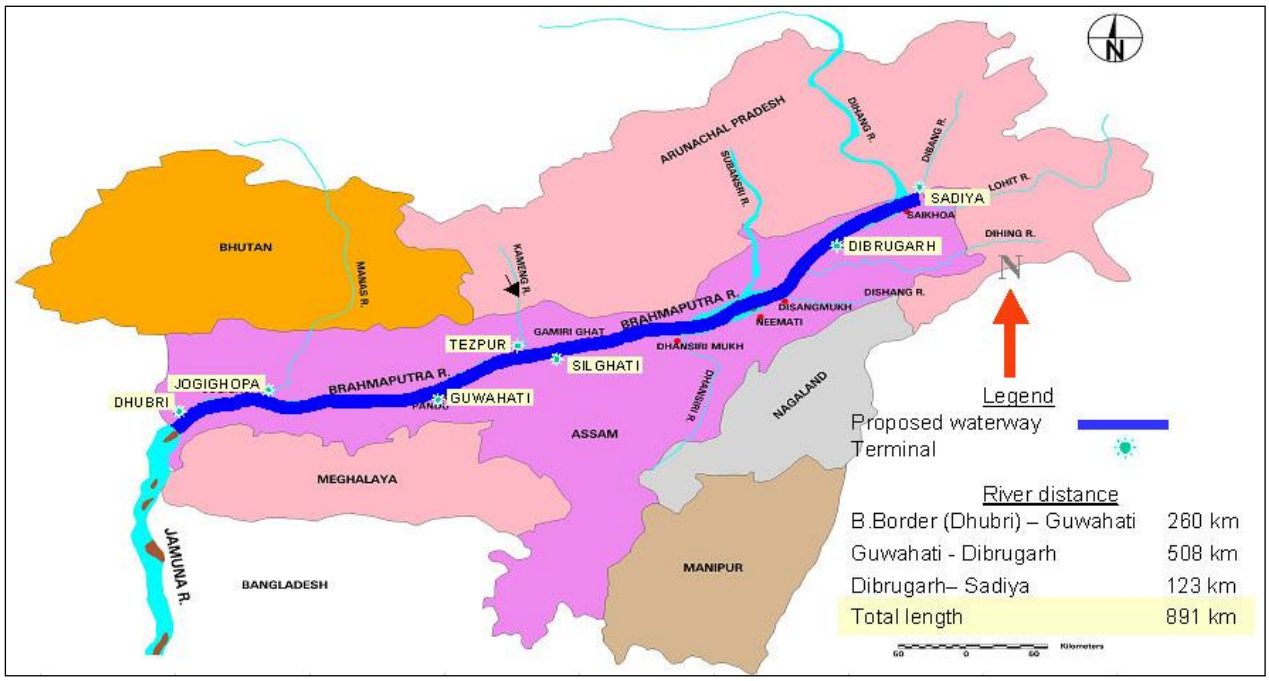
### 6.1.1 National Waterways-1 (The Ganga-Bhagirathi-Hooghly)

The Ganga - Bhagirathi - Hooghly River System between Haldia (Sagar) and Allahabad (1620 km) was declared as National Waterway-1 in 1986. Since then Inland Waterways Authority of India (IWAI) is carrying out various developmental works on the waterway for improvement of its navigability and also development and maintenance of other infrastructure such as navigation aids and terminal facilities as laid down in the IWAI Act, 1985 (82 of 1985). During 2021-22, the important works carried out for development and maintenance of fairway, navigational aids and terminal facilities on NW-1 for maintenance of the following Least Available Depth (LAD):

i. Haldia - Farakka stretch (560 km) – 2.6 m to 3.0 m
ii. Farakka - Barh stretch (400 km) – 2.1 m to 2.5 m
iii. Barh - Ghazipur stretch (290 km) – 1.6 m to 2.0 m
iv. Ghazipur - Chunar/Allahabad (370 km) – 1.1 m to 1.5 m




### 6.1.2 National Waterways-2 (River Brahmaputra)



National Waterway-2: River Brahmaputra from Dhubri (Bangladesh Border) to Sadiya (891 km) was declared as National Waterway-2 (NW-2) in 1988. The waterway is being developed with fairway of required depth and width, day and night navigation aids and terminals. The facilities created on NW-2 and planned in the near future are as under:

(i) Fairway development works/River conservancy works
(ii) Aids to navigation
(iii) Terminals
(iv) Development of Ship repair facility at Pandu
(v) Pandu Approach Road
(vi) RO-PAX Service commenced in national waterways-II

### 6.1.3 National Waterway-3 (West Coast Canal)

West Coast Canal from Kottapuram to Kollam (168 km) together with Champakara canal (14 km) and Udyogmandal canal (23 km) was declared as NW-3 in 1993. The National Waterways Act, 2016 included stretch of West Coast Canal from Kottapuram to Kozhikode for a length of 165 km, thereby extending the total length of NW-3 to 370 km. IWAI is conducting channel developmental works that includes dredging for providing fairway of 2.20 m LAD, channel width of 38/32 m, 24 hours navigational facilities and terminal facilities equipped with mechanical cargo handling equipment. IWAI has constructed nine permanent terminals at Kottapuram, Aluva, Maradu, Vaikkom, Thanneermukkom (Cherthala), Alapuzha, Kayamkulam, Thrikkunnapuzha and Kollam. In addition, two terminals with Ro-Ro facilities have been constructed by IWAI at Bolghatty and Willingdon Island. NW-3 is provided with 24 hours navigational aids in the entire route. An average tonnage of 7.57 Lakh Tonnes of cargo moved on NW-3 per annum in the last five years. IWAI has sanctioned Rs. 38 Cr for reconstruction of lock gate at Trikkunnapzha across NW-3 for utilization of full capacity of NW-3 under execution through State Govt. of Kerala. The NW-3 is fully navigable.

### 6.1.4 National Waterway-4

National Waterway-4was declared in 2008 for the length of 1,078 km comprising of the Kakinada-Puducherry stretch of canals and the Kaluvelly Tank, Bhadrachalam-Rajahmundry stretch of River Godavari and Wazirabad-Vijayawada stretch of River Krishna in Andhra Pradesh & Tamil Nadu. With the notification of the National Waterways Act 2016, the total length of NW-4 got extended to 2,890 km.

### 6.1.5 National Waterway-5

i. Government of India declared National Waterway-5 (NW-5) in Mahanadi/ Brahmani delta, Matai River & East Coast Canal (ECC) in November 2008 for total length of about 588 km. The Brahmani / Mahanadi river basins extending in Madhya Pradesh, Jharkhand & Odisha have rich deposits of minerals, coal, iron ore and large production of various industrial & agricultural products. The likely commodities to be transported through NW-5 could be divided into three groups namely, Minerals (Coal, Iron Ore), Agricultural products (Paddy, Rice, Straw, Animal fodder, fish, Jute) and Finished goods / Manufactured products (from Kalinganagar industries, textiles and forest). IWAI awarded the preparation of Detailed Project Report on NW-5 (East Coast Canal & Brahmani / Kharsua River System) to WAPCOS Ltd and DPR submitted in March, 2010. The length-wise distribution of NW-5 in 3 different stretches, a total of 588 km, as per the DPR is given below:

(i) Stretch I: Talcher to Mangalgadi : 237 km
(ii) (ii) Stretch II: Dhamra to Paradip : 95 km
(iii) Stretch III: Dhamra to Geonkhali : 256 km
Total : 588 km

ii. Based on the feasibility studies conducted and DPR updated on 2016 and also keeping in view the potential of cargo movements as emanated through various studies, it was decided to initially develop 332 km of economically & commercially viable stretches of NW-5 between Paradip/Dhamra and Talcher in following 2 phases and balance length of the waterway from Dhamra to Geonkhali is not considered feasible for development:

(i) Phase-I between Paradip/Dhamra and Pankapal : 212 km
(ii) Phase-II Pankapal to Talcher : 120 km

Phase-I development covering 212 km between Paradip/Dhamra and Pankapal is proposed.

### 6.2 Development of 106 new National Waterways

Government declared 111 (including 5 existing and 106 new) National Waterways (NWs) spread over 24 States under the National Waterways Act, 2016, which came into effect from 12th April, 2016 to promote Inland Water Transport (IWT) in the country. A list of all the NWs with their approx. length is given at https://shipmin.gov.in/sites/default/files/IWT%202021-22%20Approved%20Publication.pdf. Efforts initiated towards undertaking the developmental activities for providing safe fairway channel and creating infrastructures, in phased manner on the identified new National Waterways from 2016-17.

#### 6.2.1 Status of 106 new National Waterways

**i.** The Feasibility Reports (FRs) and the Detailed Project Reports (DPRs) of new 106 NWs, have been completed. After detailed analysis of the outcomes and recommendations of the FRs/DPRs, input from stakeholders, 106 NWs have been categorized into three categories. The detailed parameters which have been analyzed and considered for above categorization has been elaborated in the Annex below:

| | | | |
|---|---|---|---|
| **1** | Category 'A': Feasible NWs with Cargo | 18 NWs | NW-9, 10, 16, 27, 68, 111, 25, 28, 37, 40, 44, 73, 85, 86, 97, 100, 57 & 94 |
| **2** | Category 'B': Feasible NWs with only Tourism potential/Ferry/Cruise | 25 NWs | NW-6, 7, 8, 14, 15, 18, 20, 23, 24, 29, 30, 36, 42, 47, 50, 52, 83, 87, 88, 90, 91, 95, 104, 108 & 110 |
| **3** | Category 'C': NWs not feasible for Cargo/Cruise | 63 NWs | Remaining NWs except enlisted in 1 & 2 above |

**ii.** In addition to earlier existing 5 NWs as detailed in Para 6.1 above, new national waterways which are considered the most viable and where development activities have been initiated in Phase I are:

(i) River Barak (NW-16),
(ii) Sundarbans (Protocol Route) Waterways (NW-97),
(iii) Cumberjua River (NW-27),
(iv) Mandovi River (NW-68),
(v) Zuari River (NW-111),
(vi) Alappuzha- Kottayam- Athirampuzha Canal (NW-9)
(vii) Alappuzha- Changanassery Canal (NW-8)
(viii) Rupnarayan River (West Bengal) (NW -86)
(ix) River Ghaghra (NW -40)

### 6.3 Cargo Movement on Major Waterways

The details of cargo moved on the four national waterways, waterways of Goa, Maharashtra, Gujarat, Sundarbans & Icchamati waterways which carry most of the cargo traffic on India's Inland Waterways are given at Table 6.1. The total cargo movement on India's waterways comprising the national waterways (NWs)(NW-1,2,3,4) and NWs in the State of Goa, Maharashtra, Gujarat, Sundarban and Icchamati & others was 1087.93 Lakh tonnes in 2021-22 as against 836.11 Lakhs tonnes in 2020-21, reflecting an increase of 30.11%. Goa, Maharashtra, Gujarat, Sundarbans & Icchamati accounted for cargo movement of 4.2%, 40.1%, 27.0%, 5.6% and 0.8% respectively of the total cargo volume in 2021-22. In terms of tonne km, there was a decrease by 13.82% in 2021-22 over 2020-21 and cargo carried on Indian Waterways is 35.29 Tonne kms. Goa, Maharashtra, Gujarat, Sundarbans, Icchamati waterways though accounted 77.70 % of the total cargo movement on inland waterways across India, in terms of tonne km their share was 46.2% only.

**Table 6.1: Cargo Movement on Major Waterways**

| Sl. No. | Details of Waterways | Cargo Moved (Lakh Tonnes) | | | Tonne kms (In Lakh) | | |
|---|---|---|---|---|---|---|---|
| | | 2019-20 | 2020-21 | 2021-22 | 2019-20 | 2020-21 | 2021-22 |
| 1 | National Waterways 1 | 91.12 | 92.06 | 109.28 | 46240 | 23309.40 | 20082.07 |
| | | (12.7) | (11.0) | (10.0) | (64.5) | (52.33) | (52.3) |
| 2 | National Waterways 2 | 3.93 | 3.07 | 4.28 | 100 | 44.90 | 74.38 |
| | | (0.5) | (0.4) | (0.4) | (0.1) | (0.1) | (0.2) |
| 3 | National Waterways 3 | 5.46 | 7.38 | 16.95 | 100 | 214.80 | 179.19 |
| | | (0.8) | (0.9) | (1.6) | (0.1) | (0.5) | (0.5) |
| 4 | National Waterways 4 | 0.82 | 68.32 | 112.34 | - | 189.90 | 316.47 |
| | | (0.1) | (8.2) | (10.3) | - | (0.4) | (0.8) |
| **Sub Total NWs** | | **101.33** | **170.83** | **242.85** | **46440.00** | **23759.00** | **20652.11** |
| | | (14.1) | (20.4) | (22.3) | (64.8) | (53.3) | (53.8) |
| 5 | Goa Waterways | 29.33 | 84.61 | 45.78 | 1467.00 | 4124.40 | 2155.39 |
| | | (4.1) | (10.1) | (4.2) | (2.0) | (9.3) | (5.6) |
| 6 | Maharashtra Waterways | 243.93 | 282.10 | 436.06 | 13172.00 | 5697.00 | 1592.35 |
| | | (33.9) | (33.7) | (40.1) | (18.4) | (12.8) | (4.1) |
| 7 | Gujarat Waterways | 310.15 | 257.12 | 293.67 | 4652.00 | 4413.00 | 3117.61 |
| | | (43.1) | (30.8) | (27.0) | (6.5) | (9.9) | (8.1) |
| 8 | Sundarban Waterways | 34.61 | 38.61 | 61.03 | 5988.00 | 6558.70 | 10160.54 |
| | | (4.8) | (4.6) | (5.6) | (8.3) | (14.7) | (26.5) |
| 9 | Icchamati & others | | 2.84 | 8.54 | | | 716.17 |
| | | | (0.3) | (0.8) | | | (1.6) |
| **Grand Total** | | **719.35** | **836.11** | **1087.93** | **71719.00** | **44552.10** | **38394.17** |

Source: 'Statistics of Inland Water Transport, 2021-22', M/o Ports, Shipping & Waterways

Note:

1. Cargo handled in Kolkata-Bangladesh-Kolkata route is included in the traffic on National Waterway I. The route is a link between NW-I & NW-II through Bangladesh.
2. Figure within brackets indicates percentage to the total.

*******

# Section-VII
# Hydro-Electric Potential

i. Hydro-Electric forms an integral part of overall development of water resources of the river basin. The hydro-schemes also form part of the complex integrated power generation system with diverse power generation resources. In the planning of hydro development and deciding on installed capacity etc, these two inter-connections viz. with the water resources developments of the river basin and with the power system are to be kept in view. In the overall basin context, the impact of operation of upstream projects, constraints imposed by the downstream projects, irrigation diversions downstream, flood moderation etc. are to be considered. Further, with progressive development of consumptive water use and new water resources-based development projects in the river basin; water availability would undergo considerable changes over the life of the plant. These are some of the important aspects which have to be considered while planning hydro-electric/multipurpose projects.

ii. India has total identified hydropower potential of about 1,48,701 MW out of which 1,45,320 MW of hydropower potential is in stations with installed capacity over 25 MW. During 2021-22, the Hydel generation was 1,51,627.33 GWh which was about 10.21% of total electricity generation.

iii. This Section provides the data/information on electricity generation & consumption. It also provides Region/State-wise and Basin-wise status of Large Hydro Electric Potential Development (in terms of installed capacity - above 25 MW).

**Table 7.1: Electricity Generation & Consumption**

| Sl. No. | Year | Hydel Generation (GWh*) | % of Hydel to Total Generation | Electricity Consumed in Agriculture (GWh*) | % of Agriculture to Total Consumption |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 2012-13 | 113720.29 | 11.79 | 147461.92 | 20.80 |
| 2 | 2013-14 | 134847.53 | 13.13 | 152744.33 | 20.31 |
| 3 | 2014-15 | 129243.69 | 11.57 | 168913.46 | 20.75 |
| 4 | 2015-16 | 121376.65 | 10.40 | 173185.37 | 20.06 |
| 5 | 2016-17 | 122377.56 | 9.91 | 191150.89 | 20.91 |
| 6 | 2017-18 | 126122.70 | 9.68 | 199246.85 | 20.47 |
| 7 | 2018-19 | 134893.62 | 9.83 | 213409.18 | 20.57 |
| 8 | 2019-20 | 155769.12 | 11.26 | 211294.89 | 20.08 |
| 9 | 2020-21 | 150299.52 | 10.95 | 221303.44 | 21.25 |
| 10 | 2021-22 | 151627.33 | 10.21 | 228451.46 | 17.35 |

Source: PDM Division, Central Electricity Authority, M/o Power

Note: 'GWh*': Gigawatt hours/Billionwatt hours/Million kilowatt hours (Million Units).

**Table 7.2: Status of Large Hydro Electric Potential Development (Region/State-wise)**
**(In terms of Installed Capacity - Above 25 MW)**

**(as on 31.03.2022)**

| Region/ State | Identified Capacity as per Reassessment Study (1978-87) | Capacity In Operation | | Capacity under Active Construction | | Capacity on which Construction is held up | | Capacity yet to be taken up under Construction | |
|---|---|---|---|---|---|---|---|---|---|
| | Above 25 MW | (MW) | % | (MW) | % | (MW) | % | (MW) | % |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Northern** | | | | | | | | | |
| Jammu & Kashmir | 11567.00 | 3360.00 | 29.05 | 2511.50 | 21.71 | 48.00 | 0.41 | 5647.50 | 48.82 |
| Ladakh | 2046.00 | 89.00 | 4.35 | 0.00 | 0.00 | 0.00 | 0.00 | 1957.00 | 95.65 |
| Himachal Pradesh | 18470.00 | 10065.00 | 54.49 | 2146.00 | 11.62 | 44.00 | 0.24 | 6215.00 | 33.65 |
| Punjab | 971.00 | 1096.30 | 100.00 | 206.00 | 21.22 | 0.00 | 0.00 | 0.00 | 0.00 |
| Haryana # | 64.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Rajasthan ## | 483.00 | 411.00 | 85.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Uttarakhand | 17998.00 | 3855.40 | 21.42 | 1144.00 | 6.36 | 247.00 | 1.37 | 12751.70 | 70.85 |
| Uttar Pradesh* | 664.00 | 501.60 | 75.54 | 0.00 | 0.00 | 0.00 | 0.00 | 162.40 | 24.46 |
| **Sub Total (NR)** | **52263.00** | **19378.30** | **37.08** | **6007.50** | **11.49** | **339.00** | **0.65** | **26538.30** | **50.78** |
| | | | | | | | | | |
| **Western** | | | | | | | | | |
| Madhya Pradesh | 1970.00 | 2235.00 | 100.00 | 0.00 | 0.00 | 400.00 | 20.30 | 0.00 | 0.00 |
| Chhattisgarh | 2202.00 | 120.00 | 5.45 | 0.00 | 0.00 | 0.00 | 0.00 | 2082.00 | 94.55 |
| Gujarat ### | 590.00 | 550.00 | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Maharashtra | 3314.00 | 2647.00 | 79.87 | 0.00 | 0.00 | 0.00 | 0.00 | 667.00 | 20.13 |
| Goa | 55.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 55.00 | 100.00 |
| **Sub Total (WR)** | **8131.00** | **5552.0** | **68.28** | **0.00** | **0.00** | **400.00** | **4.92** | **2179.00** | **26.80** |

**Contd…**

**Table 7.2: Status of Large Hydro Electric Potential Development (Region/State-wise)**
**(In terms of Installed Capacity - Above 25 MW)**

**(as on 31.03.2022)**

| Region/ State | Identified Capacity as per Reassessment Study (1978-87) | Capacity In Operation | | Capacity under Active Construction | | Capacity on which Construction is held up | | Capacity yet to be taken up under Construction | |
|---|---|---|---|---|---|---|---|---|---|
| | Above 25 MW | (MW) | % | (MW) | % | (MW) | % | (MW) | % |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Southern** | | | | | | | | | |
| Andhra Pradesh | 3261.00 | 1610.00 | 49.37 | 960.00 | 29.44 | 0.00 | 0.00 | 691.00 | 21.19 |
| Telangana | 1099.00 | 800.00 | 72.79 | 0.00 | 0.00 | 0.00 | 0.00 | 299.00 | 27.21 |
| Karnataka | 6459.00 | 3689.20 | 57.12 | 0.00 | 0.00 | 0.00 | 0.00 | 2769.80 | 42.88 |
| Kerala | 3378.00 | 1856.50 | 54.96 | 100.00 | 2.96 | 0.00 | 0.00 | 1421.50 | 42.08 |
| Tamil Nadu | 1693.00 | 1778.20 | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Sub Total (SR)** | **15890.00** | **9733.90** | **61.26** | **1060.00** | **6.67** | **0.00** | **0.00** | **5096.10** | **32.07** |
| | | | | | | | | | |
| **Eastern** | | | | | | | | | |
| Jharkhand | 582.00 | 210.00 | 36.08 | 0.00 | 0.00 | 0.00 | 0.00 | 372.00 | 63.92 |
| Bihar #### | 40.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Odisha | 2981.00 | 2154.60 | 72.28 | 0.00 | 0.00 | 0.00 | 0.00 | 826.50 | 27.72 |
| West Bengal | 2829.00 | 441.20 | 15.60 | 120.00 | 4.24 | 0.00 | 0.00 | 2267.80 | 80.16 |
| Sikkim | 4248.00 | 2282.00 | 53.72 | 620.00 | 14.60 | 417.00 | 9.82 | 929.00 | 21.87 |
| **Sub Total (ER)** | **10680.00** | **5087.80** | **47.64** | **740.00** | **6.93** | **417.00** | **3.90** | **4435.30** | **41.53** |

**Contd…**

**Table 7.2: Status of Large Hydro Electric Potential Development (Region/State-wise)**
**(In terms of Installed Capacity - Above 25 MW)**

**(as on 31.03.2022)**

| Region/ State | Identified Capacity as per Reassessment Study (1978-87) | Capacity In Operation | | Capacity under Active Construction | | Capacity on which Construction is held up | | Capacity yet to be taken up under Construction | |
|---|---|---|---|---|---|---|---|---|---|
| | Above 25 MW | (MW) | % | (MW) | % | (MW) | % | (MW) | % |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **North Eastern** | | | | | | | | | |
| Meghalaya | 2298.00 | 322.00 | 14.01 | 0.00 | 0.00 | 0.00 | 0.00 | 1976.00 | 85.99 |
| Tripura | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Manipur | 1761.00 | 105.00 | 5.96 | 0.00 | 0.00 | 0.00 | 0.00 | 1656.00 | 94.04 |
| Assam | 650.00 | 350.00 | 53.85 | 120.00 | 18.46 | 0.00 | 0.00 | 180.00 | 27.69 |
| Nagaland | 1452.00 | 75.00 | 5.17 | 0.00 | 0.00 | 0.00 | 0.00 | 1377.00 | 94.83 |
| Arunachal Pradesh | 50064.00 | 1115.00 | 2.23 | 2000.00 | 3.99 | 0.00 | 0.00 | 46949.00 | 93.78 |
| Mizoram | 2131.00 | 60.00 | 2.82 | 0.00 | 0.00 | 0.00 | 0.00 | 2071.00 | 97.18 |
| **Sub Total (NER)** | **58356.00** | **2027.00** | **3.47** | **2120.00** | **3.63** | **0.00** | **0.00** | **54209.00** | **92.89** |
| **All India** | **145320.00** | **41778.90** | **28.75** | **9927.50** | **6.83** | **1156.00** | **0.80** | **92457.60** | **63.62** |

Source: Hydro Electric Potential Reassessment Division (HEPR), Central Electricity Authority, M/o Power

Note:

1. Does not include pumped storage Projects.
2. In some States the total of the capacity developed and balance capacity is different from the potential assessed. This is due to change in capacity of the Projects, addition/deletion of the Projects and merger of two Projects into one etc.

'*': Eastern Yamuna Canal project (35 MW) has been developed in 2 stages each having Installed Capacity below 25 MW;
'#': Western Yamuna Canal project (64 MW) has been developed in 4 stages each having Installed Capacity below 25 MW;
'##': Two Projects namely Mahi Bajaj Sagar I & II were identified for I.C. of 97 MW has been developed with I.C of 140 MW. Gandhi Sagar (115 MW) Project was identified in Rajasthan but has been developed in Madhya Pradesh with same capacity;
'###': Two Projects namely Ukai Dam and Sardar Sarovar were identified for an I.C. of 590 MW. However as per actual, the I.C. is 550 MW;
'####': Identified project namely East Gandak Canal has been developed with installed capacity below 25 MW.

3. In addition to above 8 PSS (4745.6 MW) are under operation, 2 PSS (1500 MW) are under active construction, 1 PSS (80 MW) on which construction is held up and 2 PSS (2200 MW) is concurred by CEA, 17 PSS (16770 MW) are under S&I, 1 PSS of I.C. 660 MW is under held up and 14 PSS (8855 MW) are under PFR/PIR/DPR list.

**Table 7.3: Status of Large Hydro Electric Potential Development Basin-wise (In terms of Installed Capacity - Above 25 MW)**

**(as on 31.03.2022)**

| Basin | Identified Capacity as per Reassessment Study | Capacity In Operation | | Capacity under Active Construction | | Capacity on which Construction is held up | | Capacity yet to be taken up under Construction | |
|---|---|---|---|---|---|---|---|---|---|
| | Above 25 MW | (MW) | % | (MW) | % | (MW) | % | (MW) | % |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Indus** | 33028 | 14439.3 | 43.72 | 4863.50 | 14.73 | 48.0 | 0.15 | 13677.2 | 41.41 |
| **Ganga** | 20252 | 5567.2 | 27.49 | 1144.0 | 5.65 | 291.0 | 1.44 | 13249.85 | 65.42 |
| **Central Indian Rivers** | 3868 | 3159.8 | 81.69 | 0.0 | 0.00 | 400.0 | 10.34 | 308.2 | 7.97 |
| **West Flowing Rivers** | 8997 | 5676.7 | 63.10 | 100.0 | 1.11 | 0.0 | 0.00 | 3220.3 | 35.79 |
| **East Flowing Rivers** | 13775 | 8249.0 | 59.88 | 960.0 | 6.97 | 0.0 | 0.00 | 4566.1 | 33.15 |
| **Brahmaputra** | 65400 | 4687.0 | 7.17 | 2860.0 | 4.37 | 417.0 | 0.64 | 57436.0 | 87.82 |
| **All India** | **145320** | **41778.9** | **28.75** | **9927.5** | **6.83** | **1156.0** | **0.80** | **92457.6** | **63.62** |

Source: Hydro Electric Potential Reassessment Division (HEPR), Central Electricity Authority, M/o Power.

Note:

1. Does not include pumped storage Projects.
2. In some States the total of the capacity developed and balance capacity is different from the potential assessed. This is due to change in capacity of the Projects, addition/ deletion of the Projects and merger of two Projects into one etc.
3. In addition to above 8 PSS (4745.6 MW) are under operation, 2 PSS (1500 MW) are under active construction, 1 PSS (80 MW) on which construction is held up and 2 PSS (2200 MW) is concurred by CEA, 17 PSS (16770 MW) are under S&I, 1 PSS of I.C. 660 MW is under held up and 14 PSS (8855 MW) are under PFR/PIR/DPR list.

*******

# Section – VIII
# International Treaties and Cooperation

This Section consists of the list of 13 Nos. of Memorandum of Understanding (MoU) and 2 Nos. of Memorandum of Cooperation (MoC) between India & other countries and brief note on the International Treaties and Transboundary Cooperation of India with five neighbouring countries on trans-boundary rivers in the field of Water Resources Management.

## 8.1 Cooperation with other countries in the field of Water Resources Management

Cooperation with other countries in water sector help water experts to set new standards for water resources management by sharing best practices, knowledge, latest technology and breakthroughs in theoretical and applied science etc. India has signed following MoUs with other countries:

| Sl. No. | MoU Details | Current Progress/ Status of Activities undertaken |
|---|---|---|
| **1.** | MoU between India and Australia | The MoU between India and Australia on cooperation, in the field of water resources management, was signed on 10.11.2009 and subsequently renewed on 5.9.2014 and 20.05.2020 for a period of 5 years.<br><br>India-Australia JWG meetings has been held so far and as per JWG meeting held on 11th-13th July, 2018, collaboration on following 2 projects viz.<br>i. Irrigation efficiency pilot project and<br>ii. Brahmani-Baitarni Integrated Water Resources Management Phase are being taken up.<br><br>3rd Joint Working Group Meeting between India and Australia under renewed MoU was held on 22th September, 2020.<br>i. Irrigation Efficiency Pilot Project<br><br>Subarnarekha Irrigation Project (Odisha) has been finalized as the pilot project for increasing the water/crop productivity. |
| **2.** | MoU between India and Hungary | MoU between India and Hungary on Water Management was signed on 16.10.2016 and automatically renewed w.e.f. 16.10.2021 for a further period of 5 years as per automatic renewal clause in MoU.<br><br>Following issues has been agreed under Working program for bilateral Hungarian-Indian Cooperation for the period of 2021-2023:<br>i. Integrated water resources management<br>ii. Flood management<br>iii. Drought and water scarcity management<br>iv. Rejuvenation of rivers and other water bodies<br>v. Research and education<br>1st Pre-Meeting of the JWG was held virtually on dated 20.11.2020.<br>The pre JWG Indo-Hungary meeting was held on 20.11.2020 under |

**Contd…**

| Sl. No. | MoU Details | Current Progress/ Status of Activities undertaken |
|---|---|---|
| | | the Co-Chairmanship of Shri Subodh Yadav, JS (Admn./IC&GW), D/o WR, RD&GR, Government of India and Mr. Peter Kovacs, Water Director, Ministry of Interior of Hungary. During the meeting, both the sides agreed to put priority on management of extreme phenomena, mitigation of the impact of climate change on water resources, protection and preservation of the quality of water resources and to facilitate knowledge exchange programs between experts & relevant institutions. A three-year working program has also been finalized in the meeting which will be signed by both sides in the next JWG meeting. |
| **3.** | MoU between India and Morocco | MoU between India and the Morocco was signed on 14.12.2017 for a period of 5 years on cooperation in the field of Water Resources.<br><br>Further cooperation in various areas like Sediment management, climate change impacts, Ground water management, Nuclear Science application (Basin wise Isotope studies of ground water and surface water) in water resources and capacity building is expected.<br><br>3rd Joint Working Group (JWG) meeting was held on 13th July, 2021 via virtual platform under the joint chairmanship of Commissioner (CAD)- D/o Water Resources, RD&WR and Director of Research and Planification of Water, Ministry of Equipment, Transport, Logistics and Water, Government of Morocco. |
| **4.** | MoU between India and European Union | MoU between India and European Union was signed on 07.10.2016 for a period of 5 years on water cooperation. The MoU automatically renewed w.e.f. 07.10.2021 for a further period of 5 years as per automatic renewal clause in MoU. The Phase-I of the IEWP (2017-2020) ended in October, 2020 and the phase II (2020-2023) started in November, 2020.<br><br>Indo-European Water partnership (IEWP) with a view to bring together representatives of relevant stakeholders, including interested EU Member States and Indian States, European and Indian institutions, business and civil society. The objective of the MoU is to strengthen the technological, scientific and management capabilities of India and the EU in the field of water management on the basis of equality, reciprocity and mutual benefit.<br><br>A meeting was convened under the Chairmanship of Member (WP&P), CWC on 13th September, 2021 with EU Delegation and IEWP Nodal officers from CWC, CGWB, NMCG to discuss the flexible Action Plan of IEWP Action Phase 2 regarding all four work are as i.e.<br>i. River Basin Management,<br>ii. Irrigation and Efficient Water Use<br>iii. E-Flows Assessment and<br>iv. Safe Reuse of Treated Water. |

**Contd…**

| Sl. No. | MoU Details | Current Progress/ Status of Activities undertaken |
|---|---|---|
| | | Remark: Indo-European Water partnership (IEWP) with a view to bring together representatives of relevant stakeholders, including interested EU Member States and Indian States, European and Indian institutions, business and civil society to strengthen, promote and develop cooperation in the field of water management on the basis of equality, reciprocity and mutual benefits. |
| **5.** | MoU between India and Israel | MoU between India and Israel was signed on 11.11.2016 for a period of 5 years on water resource management and development. The MoU automatically renewed w.e.f. 11.11.2021 for a further period of 5 years as per automatic renewal clause in MoU<br><br>MoU envisages cooperation at the regional, national and international level in the field of water resources development and management by collaborating and sharing of experience and expertise in the areas mutually agreed upon, including technique in the efficient use of waste water desalination, aquifer recharge and in-situ water conservation techniques and water management.<br><br>1st JWG meeting was held on 03.05.2018 in India.<br><br>2nd JWG meeting was held on 08.12.2020 (virtually). |
| **6.** | MoU between India and Netherlands | MoU between India and Netherlands in the field of water management was signed on 27.6.2017 for a period of 5 years. Further, on 29th March, 2022, a Strategic Partnership on Water was signed between Ministry of Jal Shakti and Ministry of Infrastructure and Water Management, Kingdom of the Netherlands.<br>MoU envisages cooperation in the River Basin Management Planning/Integrated Water Resources Management, Pollution abatement for Rivers including River Ganga, Decision Support Systems (data gathering, applications of Remote Sensing & GIS in Hydrology and Water Resources), Delta Management-Water safety including Flood Management along rivers, deltas and coasts, Promoting water management, water quality issues and waste water recycling and re-use through innovative concession arrangements.<br><br>3rd Joint Working Group (JWG) meeting was held on 7th September, 2021 via virtual platform under the joint Chairmanship of DG, NMCG and Special Envoy for International Water Affairs, Ministry of Infrastructure and Water Management, Government of Netherlands. |
| **7.** | MoU between India and United States of America | MoU between India and United States Geological Survey, United States of America was signed in 17.12.2019 on scientific and technical cooperation in the field of water resources.<br><br>Suggestive list of activities proposed by Principal Representative/Interlocutor:<br>i. Collaborating in Developing Integrated Hydrological Modeling Tools. |

**Contd…**

| Sl. No. | MoU Details | Current Progress/ Status of Activities undertaken |
|---|---|---|
| | | ii. Collaboration in the field of Modern Irrigation Management Using low cost and water efficient technologies. Applications of IoT (Internet of Things) for improving water use/application efficiency at various spatial scales (eg. at farm level, canal head, reservoir, river basin scale etc.)<br>iii. Stream channel Morphology, Erosion Processes and Geomorphology. Ecological Flows.<br>iv. Aquifer Mapping in 2D/3D, Aquifer Response Modeling, Aquifer Management, Coastal Aquifer Management.<br>v. Capacity Building& Technology transfer.<br><br>Remarks: The USGS and the D/o WR, RD&GR have agreed to pursue scientific and technical cooperation in the field of water resources through the MoU signed between both countries. |
| **8.** | MoU between India and Tanzania | MoU between India and Tanzania on bilateral cooperation in the field of Water Resources Management and Development was signed on 10.07.2016 for period of 5 years and renewed w.e.f. 10.07.2021 for a further period of 5 years.<br><br>1st JWG Meeting was held in Tanzania on 17.05.2019.<br><br>As per outcome of JWG Meeting, bilateral cooperation may be extended in technical fields like IWRM, preparation of DPRs of water projects, application of GIS and remote sensing in WRM, Aquifer mapping, Bilateral arrangements for capacity building Training to Tanzanian Officials by NWA, Pune or RGI, Raipur depending on the areas of interests in water sector.<br><br>NWA, Pune has submitted a Training Programme proposal for conducting Two weeks training programme including financial implication for 15 number of officers of Tanzania. This Training is proposed of officials of Tanzania to be on 'Investigation and preparation of DPRs of water resources projects at a total cost of Rs.14,57,000/-. The proposal has been sent to MEA seeking their comments regarding funding possibility of this training programme under ITEC. |
| **9.** | MoU between India and Cambodia | MoU between India and Cambodia on cooperation in the field of water resource management was signed on 08.12.2007 and extended for a period of five years w.e.f. 7.12.2017<br><br>Exchange of experts and organization of training programs; study tour in the areas of development and management of water resources, both surface and ground water.<br><br>No bilateral request. This MoU is de-prioritized'. The action on this MoU will be taken on bilateral request received through Ministry of External Affairs. |

**Contd…**

| Sl. No. | MoU Details | Current Progress/ Status of Activities undertaken |
|---|---|---|
| **10.** | MoU between India and Rwanda | MoU between India and Rwanda in the field of water resource development and management was signed on 22.01.2013 for a period of 5 years and automatically renewed w.e.f. 22.01.2018 for a further period of 5 years as per automatic renewal clause in MoU.<br>Cooperation in agriculture, water resources management & capacity building including marshland and hillslide irrigation; watershed management & water governance; irrigation projects techniques; procedure of planning irrigation projects; guidelines for water management for irrigation; crop water requirement; pressurized and surface irrigation techniques; water availability and reliability for irrigation projects; water use efficiency technology; on-farm water management, etc.<br><br>MoU between India and Rwanda was signed on 22.01.2013 and as per the renewal clause of the MoU the MoU may be extended for a further period of 5 years unless either of the parties given a written notice before 6 months of its expiry to terminate the MoU.<br><br>There is no progress in this MoU and hence it has been kept in deprioritized category and action may be initiated on the request from MEA/ Rwanda side. |
| **11.** | MoU between India and Iraq | MoU between India and Iraq in the water resource development and management was signed on 23.08.2013 for a period of 5 years and stands automatically renewed w.e.f. 23.08.2018 for a further period of 5 years as per automatic renewal clause in MoU.<br><br>Mutual cooperation in water resources development and management including hydrology and hydrological modelling, application of remote sensing & GIS in hydrology and water resources, integrated water resources development and management, irrigation and drainage, surface and groundwater management and development minor irrigation, hydrometeorology, watershed, lakes and wetlands development, dam safety & surveillance, reservoir regulation, training and capacity building.<br><br>A request letter for imparting training to Iraqi Officials was received through MEA and accordingly, a Training programme has been customized for Iraqi officials which has been submitted to MEA for consideration and funding under ITEC programme.<br><br>The training proposal has been prepared and under finalization. |
| **12.** | MoU between India and Fiji | MoU between India and Fiji in the field of water resources management was signed on 12.2.2014 for a period of 5 years.<br><br>A suggestion for visit of Indian experts to Fiji to train Fijian officials on issues related to water engineering, hydrology, modelling etc.<br><br>MEA has been requested to take up the matter with Fijian Government for sending a format proposal seeking training in water |

**Contd…**

| Sl. No. | MoU Details | Current Progress/ Status of Activities undertaken |
|---|---|---|
| | | sector through MEA. The proposal from Fiji is awaited. |
| **13.** | MoU between India and Bahrain | MoU between India and Bahrain in the field of water resources development and management was signed on 22.02.2015 for a period of 5 years and stands automatically renewed w.e.f. 22.02.2020 for a further period of 5 years as per automatic renewal clause in MoU.<br><br>Cooperation in the field of water resources development and management, both surface and ground water through the sharing of technical expertise and experiences.<br><br>There is no progress in this MoU and hence it has been kept in deprioritized category and action may be initiated on the request from MEA/Bahrain side.<br><br>This MoU may be helpful for WAPCOS in establishing contact and initial footprint in the country from where leads are taken to Procure business through global tenders. |
| **14.** | MoC between India and Water and Japan | MoC between India and Water and Disaster Management Bureau, M/o Land, Infrastructure, Transport and Tourism of Japan in the field of Water Resource was signed on 11.12.2019 for a period of five years.<br><br>On Feb, 2021, a meeting was held between Deputy Secretary (EA&IC) of this Department with Counsellor, Embassy of Japan in New Delhi wherein the key issues were discussed in this meeting as part of future cooperation under MoC included flood control, integrated water resource management, water quality management, reclaimed water utilization, etc.<br><br>1st JWG *(*virtual*)* was held on 21.12.2021 through VC organised by Japan. During the meeting, both sides confirmed to continue discussions on the possible cooperation themes and establish a sub-group under JWG organized at the administrative level to discuss & prioritize the cooperation themes based on mutual interest such as Water Conservation, Water Use Efficiency, Mitigation of Urban Floods-Integrated Urban Flood Management, Integrated water cycle simulation, Dam inspection technology etc. |
| **15.** | MoC between India and Ministry of Environment, Japan | MoC between M/o Jal Shakti, India and Ministry of Environment, Japan was signed on 19.03.2022 for a period of 2 years in the areas decentralized domestic waste water management. |

Source: ISM-2 Directorate, Central Water Commission, M/o Jal Shakti

## 8.2 Transboundary Water Cooperation

The three major river systems of India, namely, Ganga, Brahmaputra and Indus cross international borders. These three river systems alone drain around 42% of geographical area in India and contribute around 60% to the total water regime in the country.

### 1. Cooperation with Bangladesh

i. Joint Rivers Commission (JRC) was established in 1972 to cooperate in harnessing & maximizing the benefits from common river system to both the countries. JRC is headed by Union Minister of Water Resources of both the countries. 37th meeting of JRC was held at New Delhi on 18th -19th March, 2010.

ii. India and Bangladesh share 54 trans-boundary/common border rivers. As on date, the two countries have formally signed the following Treaty/ MoU regarding sharing of water:

(i) A Treaty on the sharing of Ganga/Ganges River waters at Farakka during the lean season -1st January to 31st May every year (signed in 1996)
(ii) MoU for the withdrawal of 1.82 cusecs of water from Feni river by India for drinking water needs (signed on 5th October, 2019)

iii. A Joint Committee has been set up for implementing, joint inspection and monitoring of the sharing arrangements (as per provisions of Ganga/Ganges Water Sharing Treaty-1996) at Farakka in India and at Hardinge Bridge in Bangladesh for the lean period. 76th Joint Committee meeting held at Dhaka on 25th November, 2021.

iv. There is an existing arrangement between India and Bangladesh wherein, flood related data of certain identified stations of Ganga, Brahmaputra, Barak and other rivers is transmitted by India to Bangladesh during monsoon season for the purpose of flood forecasting and warning in their territory.

### 2. Cooperation with Nepal

i. India and Nepal signed ‘Mahakali Treaty’ in February, 1996 and implementation of India Nepal Pancheshwar Multipurpose Project (PMP) on river Mahakali (Sarda in India) is the centre piece of the Mahakali Treaty.

ii. India-Nepal Pancheshwar Development Authority (PDA) has been set up in September, 2014 for implementation of PMP.

iii. India-Nepal has signed an Agreement on Kosi Project in 1954 (amended in 1966) for building, operation and maintenance of Kosi Barrage on River Kosi and associated structures. Later on both countries signed an agreement on Gandak Project in 1959 (amended in 1964), for building, operation and maintenance of Gandak Barrage on Gandak River and associated structures.

iv. An India-Nepal Joint Committee on Water Resources (JCWR) headed by Water Resource Secretaries of both countries has been functioning with the mandate to act as an Umbrella Committee for other committees and groups, namely:
   (i) Joint Standing Technical Committee (JSTC)
   (ii) Joint Committee on Inundation and Flood Management (JCIFM)
   (iii) Joint Team of Experts (JTE)

**3. Cooperation with Bhutan**

i. A scheme titled 'Comprehensive Scheme for Establishment of Hydro-meteorological and Flood Forecasting Network on rivers Common to India and Bhutan' is in operation which consists of 32 Hydro-meteorological stations located in Bhutan flood forecasting in India. Joint Experts Team (JET) reviews the progress and other requirements of a network of 32 hydro-meteorological sites. The 35$^{th}$ JET Meeting was held at Paro, Bhutan during 6$^{th}$ -7$^{th}$ March, 2019.

ii. A Joint Group of Expert (JGE) on Flood Management has been constituted between India and Bhutan to discuss and assess the probable causes and effects of the recurring floods and erosion in the southern foothills of Bhutan and adjoining plains in India and recommend to both Governments appropriate and mutually acceptable remedial measures. The 9$^{th}$ meeting was held during 7$^{th}$-8$^{th}$ January, 2020 at Punakha, Bhutan. Due to Covid restrictions, no meetings of JGE were held in the year 2021 and 2022.

iii. In accordance with the decision taken during the first meeting of JGE, a Joint Technical Team (JTT) on Flood Management between the two countries was constituted. The purpose of JTT is to assess the field situation and provide technical support to JGE on flood management. The 6$^{th}$ meeting of JTT was held during 12$^{th}$-13$^{th}$ September, 2019 at Jalpaiguri, India. Due to Covid restrictions, no meetings of JTT were held in the year 2020, 2021 and 2022.

**4. Cooperation with Pakistan**

i. India had signed Indus Waters Treaty, 1960 with Pakistan concerning the use of waters of the Indus system of rivers.

ii. Under the Treaty, both countries undertook to establish a permanent post of Commissioner of Indus Waters. The two Commissioners constitute the Permanent Indus Commission (PIC).

iii. The 117$^{th}$ meeting of the PIC was held during 1$^{st}$-3$^{rd}$ March, 2022 in Islamabad, Pakistan.

**5. Cooperation with China**

i. Expert Level Mechanism (ELM) between India and China was set up in 2006 for co-operation on exchange of flood season hydrological data, emergency management and other issues regarding trans-border Rivers. The 12$^{th}$ meeting of ELM was held during 12$^{th}$ -13$^{th}$ June, 2019 in Ahmedabad.

ii. India signed an MoU with China on April, 2005 (renewed in 2010 & 2015) upon provision of hydrological information of the River Sutlej/Langqen Zangbo in Flood Season by China to India. The MoU on Sutlej River is under the process of renewal through diplomatic channels (expired in November, 2020).

iii. Further, In the year 2002 (renewed in 2008, 2013 and 2018), India signed an MoU with China on providing the Hydrological Information of the Yarlung Zangbu/ Brahmaputra River in Flood Season by China to India.

*******

*Appendix Glossary*

## GLOSSARY OF TERMS

| | |
|---|---|
| Area sown more than once | This represents the area on which crops are cultivated more than once during the agricultural year. This is obtained by deducting Net Area Sown from Total Cropped Area. |
| Beel | A beel is a billabong or a lake-like wetland with static water (as opposed to moving water in rivers and canals. |
| Brackish water | Brackish water (less commonly brack water) is salt water and fresh water mixed together. It is saltier than fresh water, but not as salty as seawater. It may result from mixing of seawater with fresh water, as in estuaries, or it may occur in brackish fossil aquifers. |
| Canal | Canals are waterways channels, or artificial waterways, for water conveyance, or to service water transport vehicles. They may also help with irrigation. A canal is like navigation when it parallels a river and shares part of its waters and drainage basin, and leverages its resources by building dams and locks to increase and lengthen its stretches of slack water levels while staying in its valley. In contrast, a canal cuts across a drainage divide atop a ridge, generally requiring an external water source above the highest elevation. |
| Cropping Intensity | It is the ratio of gross (total) area sown to the net area sown expressed as a percentage. |
| Culturable Command Area (CCA) | It is the area which can be physically irrigated from a scheme and is fit for cultivation. |
| Dam | Any artificial barrier which impounds or diverts water. A dam is generally considered hydrologically significant if it is 1.25 feet (0.4 m) or more in height from the natural bed of the stream and has storage of at least 15 acre-feet or it has an impounding capacity of 50 acre-feet or more and is at least six feet (2 m) above the natural bed of the stream. |
| Glacier | A glacier is a persistent body of dense ice that is constantly moving under its own weight. A glacier forms where the accumulation of snow exceeds its ablation (melting and sublimation) over many years, often centuries. Glaciers slowly deform and flow under stresses induced by their weight, creating crevasses, seracs, and other distinguishing features. |
| Gross Sown Area | This is the sum total of the areas under all crops over the various seasons in an agriculture year (i.e. from the 1$^{st}$ July to 30$^{th}$ June next year). |
| Gross Irrigated Area | It is the total area irrigated under various crops in a year, counting the area irrigated under more than one crop during the same year as many times as the number of crops grown and irrigated. |

**Contd…**

*Appendix Glossary*

## GLOSSARY OF TERMS

| | |
|---|---|
| Irrigation Potential Created (IPC) | The Irrigation potential created by a project at a given time during or after its construction is the aggregate gross area that can be irrigated annually by the quantity of water that could be made available by all the connected and completed works up to the end of the water courses or the last point in the water delivery system. It is the area that can be irrigated from a project in a design agriculture year that is from the 1st July to 30th June next year for the projected cropping pattern and accepted water allowance on its full development. Before an area is included under potential created, it has to be ensured that the water for the area to be reported upon is available and the conveyance system up to and including the irrigation outlet to serve an area up to 40 Ha in the area to be irrigated is completed. |
| Irrigation Potential Utilised | The Irrigation potential utilised is the total gross area actually irrigated by a project/scheme during the agricultural year under consideration. |
| Lake | A lake is an area filled with water, localized in a basin, surrounded by land, apart from any river or other outlet that serves to feed or drain the lake. Lakes lie on land and are not part of the ocean. Therefore, they are distinct from lagoons, and are also larger and deeper than ponds, though there are no official or scientific definitions. |
| Large Dam | A dam exceeding 15m in height above deepest river bed level and a dam between 10 and 15 m height provided volume of earthwork exceeds 0.75 MCM and storage exceeds 1 MCM or the maximum flood discharge exceeds 2000 cumec. |
| Live Capacity | It is the total amount of storage capacity available in a reservoir for all purposes, from the dead storage level to the normal water or normal pool level/surface level. It does not include surcharge, or dead storage, but does include inactive storage, active conservation storage and exclusive flood control storage. |
| Major Irrigation Scheme | A scheme having Culturable Command Area (CCA) more than 10,000 Ha is classified as major irrigation scheme. |
| Medium Irrigation Scheme | A scheme having CCA more than 2,000 Ha and up to 10,000 Ha individually is classified as medium irrigation scheme. |
| Minor Irrigation Scheme | A scheme having CCA up to 2,000 Ha individually is classified as minor irrigation scheme. |

**Contd…**

*Appendix Glossary*

## GLOSSARY OF TERMS

| | |
|---|---|
| Navigable Inland Waterways | A stretch of water, not part of the sea, over which craft of a carrying capacity not less than 50 Tonnes can navigate when normally loaded. This term covers both navigable rivers and lakes (natural water-courses, whether or not they have been improved for navigation purposes) and canals (waterways constructed primarily for the purpose of navigation). The length of rivers and canals is measured in mid channel and length of lakes, as well as lagoons, is counted as the length between the most distant points between which the transport is performed. An inland waterway forming a common frontier between two countries is reported by both. |
| Net Sown Area | It is the total area sown with crops and orchards, counting areas sown more than once in the same agricultural year only once. |
| Net Irrigated Area | It is the total area which is irrigated counting area irrigated more than once on the same land in an agricultural year once only. |
| Oxbow Lake | An oxbow lake is a U-shaped lake that forms when a wide meander of a river is cut off, creating a free-standing body of water. |
| Reporting Area for Land Utilisation Statistics | The Reporting area stands for the area for which data on land use classification are available. |
| Power(KW) | Mechanical force developed by the motive power installation in craft. This power should be measured in effective kilowatts (power transmitted to the propeller). |
| River | River is a natural flowing water course, usually freshwater, flowing towards an ocean, sea, lake or another river. |
| River Basin | River Basin is the basic hydrological unit for water resources planning and management. |
| Surface Water | Water that flows in streams and rivers and in natural lakes, in wetlands, and in reservoirs constructed by humans. |
| Total Cultivable Area | This consists of net area sown, current fallows, fallow lands other than current fallows, culturable waste and land under miscellaneous tree crops. |
| Ultimate Irrigation Potential | The ultimate irrigation potential is the gross area that can be irrigated from a project in design year for the projected cropping pattern and assumed water allowance on its full development. The gross irrigated area will be the aggregate of the areas irrigated in the different crop seasons, the areas under two seasonal and perennial crops being counted only once in the year. The Ultimate Irrigation Potential of ground water may however, be taken as the total area that can be irrigated by utilizing the Annually Rechargeable Ground Water Resource Available for Irrigation considering the gross irrigation requirement of crops grown in an unit area. |

**Contd…**

*Appendix Glossary*

## GLOSSARY OF TERMS

| | |
|---|---|
| Watershed | Watershed is a natural hydrologic entity governed by the terrain topography from where runoff is drained to a point. The term watershed is a general phenomenon thus its size and area depends on the scale of the base map used for delineation and codification. |

*******