सत्यमेव जयते

जल क्षेत्र की एक झलक-2023

WATER SECTOR AT A GLANCE-2023

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/2024/160

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WATER SECTOR AT A GLANCE-2023

जल सम्बंधित सांख्यिकी निदेशालय/Water Related Statistics Directorate
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(cwc.gov.in)

सितम्बर, 2024 September, 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-2023,' is the fourth edition, providing a comprehensive overview of water resources and related aspects across India.

This edition includes updated data on the population and estimated 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) schemes, total gross irrigated area for crops, source-wise net irrigated area in India, etc.

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 has done an excellent work to collect and compile extensive data from various Ministries, Departments, Organizations and Directorates of Central and State Governments. 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 all stakeholders in water resources field.

New Delhi

September, 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-2023' is the annual 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, 2023 in line with its previous publication for the year 2022. Further, efforts have been made to make the publication consistent with respect to the previous publications 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 and 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 Vishnu Deo Roy, CE (PPO); Shri Yogesh Paithankar, Ex-CE (PPO) and Shri Pushkar Singh Kutiyal, former CE (PPO) of CWC.

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
September, 2024

नवीन कुमार

(Navin Kumar)
Member (WP&P), CWC

PREFACE

Central Water Commission functions as an 'attached office' of the Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti and is its main technical arm. 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 brings out various publications at regular intervals.

'Water Sector At A Glance-2023' is the fourth edition of this annual publication for providing gist of water resources and related aspects at all India level. The data/information included in the present publication consisting the details on National Water Policy, 2012, Water Resources, Major & Medium and other Projects, Flood Management, Land Use Statistics, Navigation-Inland Water and Transport, Hydro-Electric Potential and International Treaties and Cooperation. 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 ex-officio Secretary to the Government of India and Shri Navin Kumar, Member (WP&P), CWC ex-officio Additional Secretary to the Government of India for their continuous support, guidance and encouragement to bring out this publication in the form.

The publication has been prepared through the combined efforts of the officers and officials of the Water Related Statistics Directorate, Project Preparation Organisation (PPO), CWC. 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. While due care has been taken to ensure accuracy of data, the possibility of some errors and omissions in the publication can't altogether be ruled out. Suggestions, if any, are welcome for improvement of the publication and may please be mailed at directorwris-cwc@nic.in .

New Delhi
September, 2024

(Vishnu Deo Roy)
Chief Engineer (PPO), CWC

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Ms. Lalita Bisht	Senior Statistical Officer
Ms. Sarita	Junior Statistical Officer

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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

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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

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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

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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

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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, glaciers and ponds; ground water acquirers, wells, springs and other conventional sources. 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 'Water Sector At A Glance-2023' 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 in line with its previous publication, 2022. The information given in the publication is collected from various Directorates of CWC, various Ministries/Departments and other organizations with updated status as on 31st March, 2023.

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, 2023, State/UT-wise Ground Water Monitoring Wells in India and State-wise Ground Water Resources in India, 2023. 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-2023, 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 14 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.

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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 2nd meeting held on 9th 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 5th meeting held on 1st 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 5th 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 14th meeting held on 7th 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.

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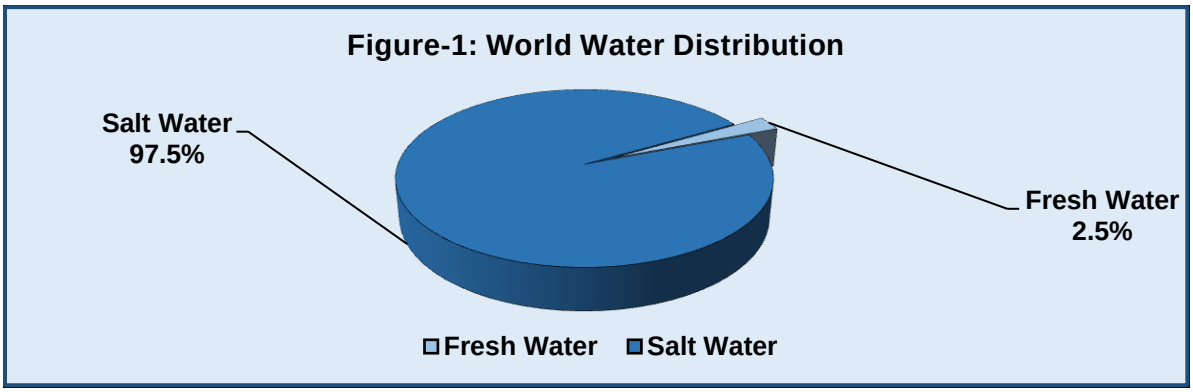
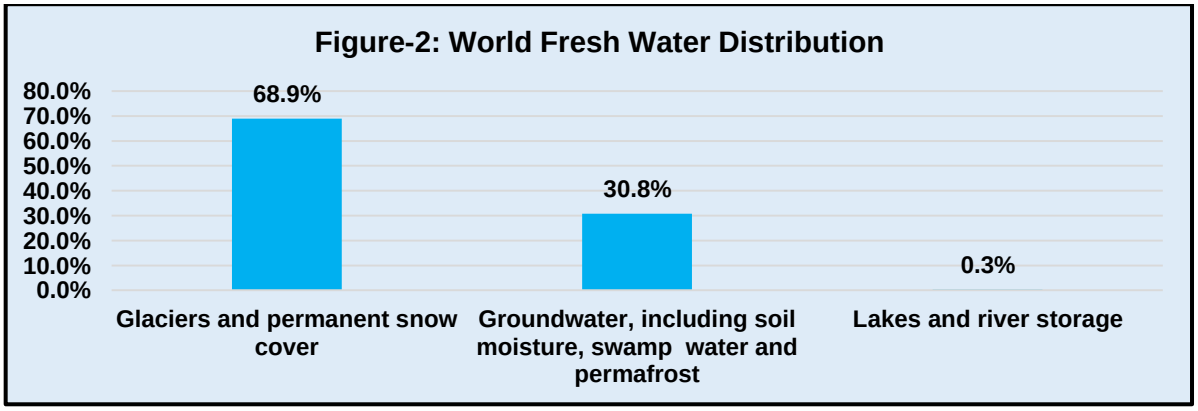
Section-II
Water Resources At A Glance

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 (2022)	1257.0 mm
B. Water Resources	
Average Annual Precipitation	4000 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-2023)	449.08 BCM
Total Annual Utilizable Water Resources	1139.18 BCM
Per Capita Water Availability (2011 Census)	1545 m^3/year
Large Dams	6281 Nos.
Completed Dams	6138 Nos.
Under Construction	143 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 31.03.2023)	
Identified Hydroelectric Potential (Total)	148701.00 MW
Identified Hydroelectric Potential (above 25 MW) as per Re-assessment Study (2017-23)	133410.03 MW
Capacity under Operation (above 25 MW)	42104.55 MW
Capacity Under Construction (above 25 MW)	13867.50 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 2021-22', 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 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)

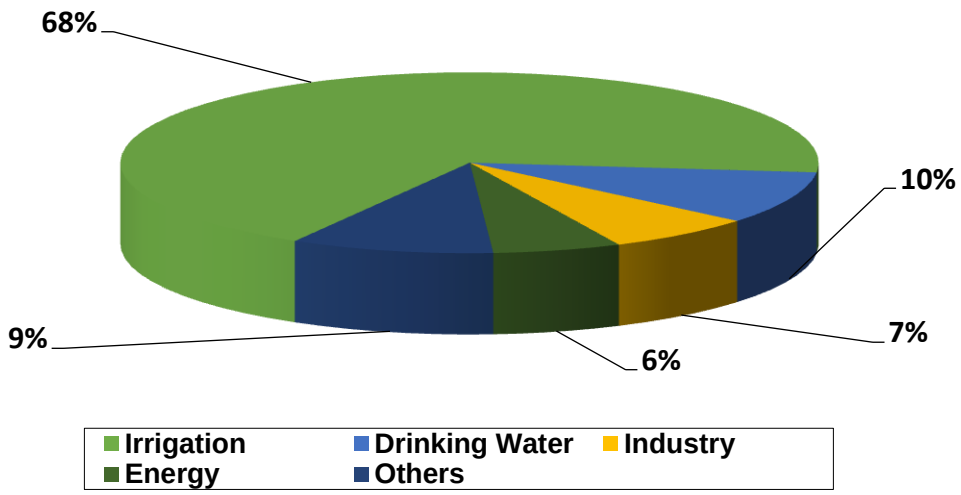
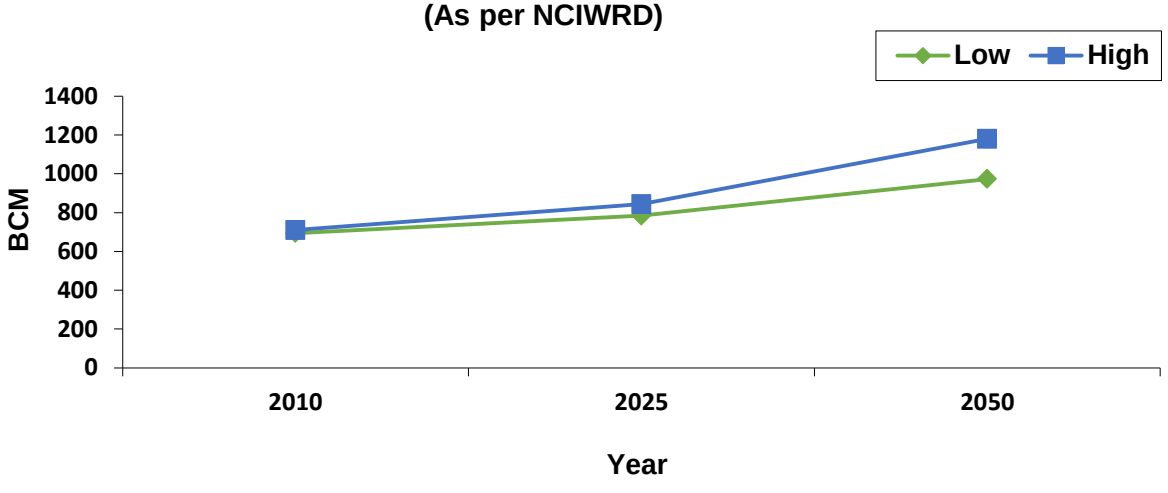


Figure-4: Projected Water Demand in India (As per NCIWRD)



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 2022-23

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	0.00	0.00
2	Arunachal Pradesh	11157.00	4	226.00	0	0.00	0.00	0.00	0.00	0.00
3	Assam	11304.48	4	3096.00	2	1863.00	94693.47	0.00	71843.50	259369
4	Bihar	21354.00	0	0.00	48	64466.00	122418.96	0.00	0.00	0.00
5	Chhattisgarh	3573.00	1757	43565.00	13	39035.00	120100.00	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	14	645.00	0	0.00	16174.00	0.00	0.00	0.00
9	Himachal Pradesh	3000.00	0	0.00	5	43785.00	878.40	0.00	0.00	0.00
10	Jammu & Kashmir	26211.00	6	4230.00	2	6000.00	1701.00	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	3385	13034.00	27	230703.00	79312.00	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	11894.80	0.00	29161.00	0 .00
17	Meghalaya	4757.76	7	717.53	0	0.00	4690.94	0.00	303.11	302.54
18	Mizoram	1750.00	3	10.00	2	8000.00	5759.10	0.00	10.00	0.00
19	Nagaland	1600.00	0	0.00	1	2258.00	3623.00	0.00	1110.00	0.00
20	Odisha	24877.75	603	34608.00	8	165771.00	154808.00	32587.00	180000.00	0.00
21	Punjab	868.00	12	686.75	1	3100.00	16812.50	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

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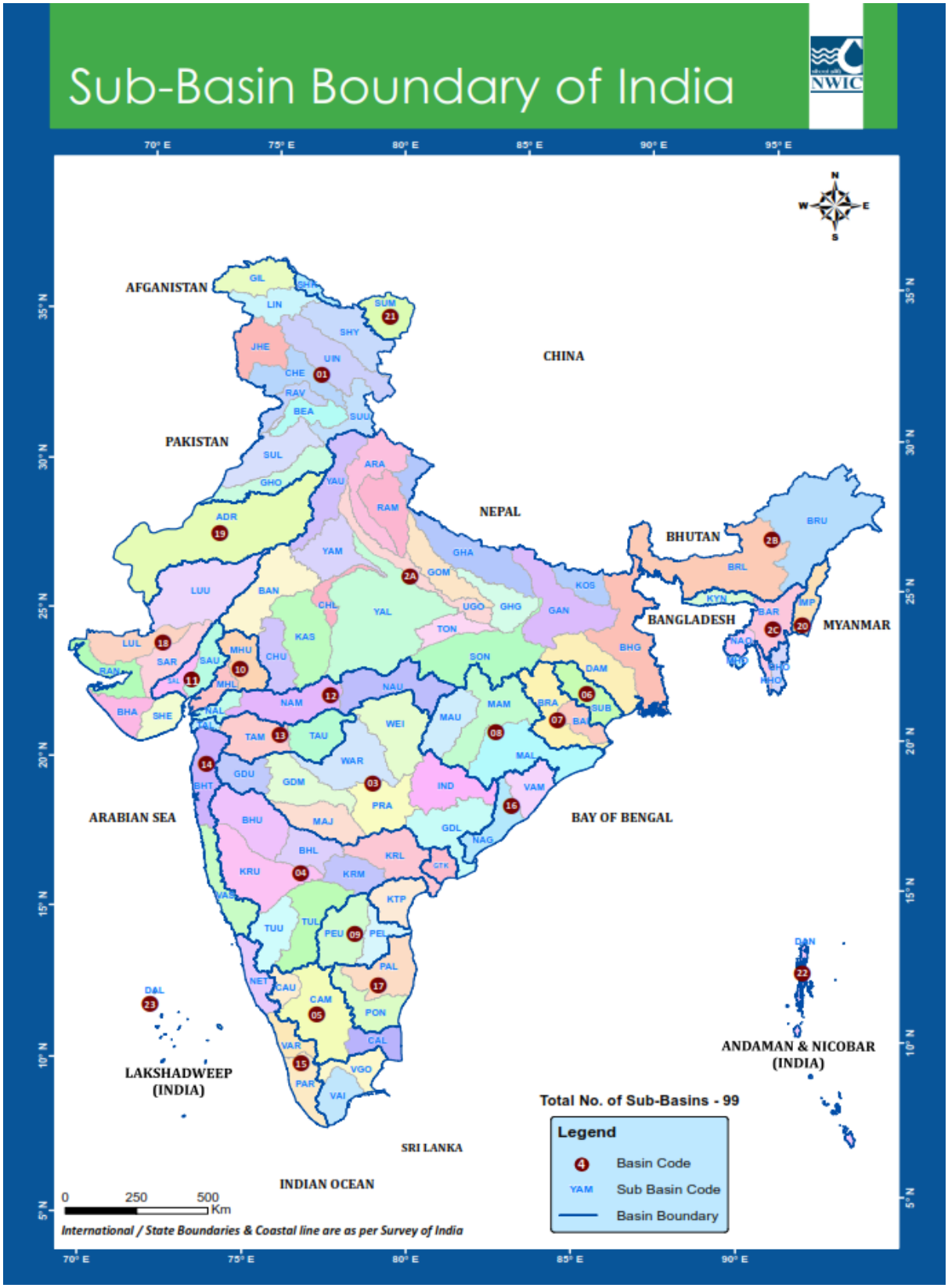
Table 2.5: Inland Fisheries Resources by States and Union Territories of India during 2022-23

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
24	Tamil Nadu	7420.00	54	16059.00	8	62015.00	218691.13	56000.00	7000.00	35283.84
25	Telangana	3492.00	53	27017.00	40	184581.00	520302.00	0.00	0.00	0.00
26	Tripura	1080.00	0	0.00	1	3049.30	30171.40	0.00	0.00	0.00
27	Uttarakhand	2686.00	0	0.00	7	20587.00	916.14	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	195.40	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	0.00	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	0.00	0	0.00	184.00	0.00	0.00	0.00
36	Puducherry	395.42	NA	303.33	NA	1357.12	473.09	82.49	0.00	0.00
All India		**304632.91**	**12906**	**754832.81**	**504**	**2106106.30**	**2745925.89**	**606819.96**	**366443.71**	**1949897.38**

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

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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 December, 2023.

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
2022	39.5	19.1	8.9	38.2	83.2	152.2	327.2	264.0	181.4	111.8	18.6	13.6	1257.0

Source: India Meteorological Department, 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- until 2021 Total Nos. 902 - since 2022)	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
June-Oct, 2022				
June, 2022	457	339	103	15
July, 2022	818	231	312	275
August, 2022	829	305	419	105
September, 2022	882	363	458	61
October, 2022	875	322	508	45

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: Change in Water Spread Area of Glacial Lakes and Water Bodies Monitored by CWC
a) Glacial Lakes & Water Bodies with Water Spread Area more than 50 Ha

Sl. No.	UID	State Name	Lake_ID	Lake Type	Water Spread Area in Ha 2011(Inventory)	% Diff in Water Spread Area w.r.t. Inventory Area					
						2022	2021	2020	2019	2018	2017
1	2	3	4	5	6	7	8	9	10	11	12
1	AP_100	Arunachal Pradesh	03_91C_064	WB	89.02	-8.56	20.20	#	7.84	#	-20.21
2	AP_101	Arunachal Pradesh	03_91C_069	WB	77.94	-3.77	-7.62	#	9.06	#	3.68
3	AP_108	Arunachal Pradesh	03_91D_009	WB	46.86	3.71	-6.10	#	15.24	#	-17.71
4	AP_109	Arunachal Pradesh	03_91D_010	WB	46.03	4.28	-2.24	#	26.00	#	6.47
5	AP_118	Arunachal Pradesh	03_91D_022	WB	43.52	-21.88	-12.68	#	28.68	#	-5.28
6	AP_135	Arunachal Pradesh	03_91D_041	WB	114.63	1.02	36.09	#	10.79	#	-32.73
7	AP_163	Arunachal Pradesh	03_91D_107	WB	66.81	11.66	1.78	-23.66	-1.21	#	-11.69
8	AP_185	Arunachal Pradesh	03_91H_067	WB	55.51	-18.57	-4.52	#	21.60	#	18.90
9	AP_203	Arunachal Pradesh	03_92A_005	WB	49.71	2.60	#	#	#	-18.37	-26.08
10	AP_204	Arunachal Pradesh	03_92A_006	WB	82.79	-8.93	-14.24	-15.45	6.29	6.04	3.12
11	AP_206	Arunachal Pradesh	03_92E_001	WB	45.42	3.48	62.92	#	34.30	-9.73	34.30
12	AP_49	Arunachal Pradesh	03_82O_042	WB	44.48	-18.17	-34.80	-7.82	23.65	#	3.77
13	AP_54	Arunachal Pradesh	03_82O_061	WB	54.48	6.09	-4.55	#	6.46	-3.91	-8.03
14	AP_55	Arunachal Pradesh	03_82O_062	WB	52.27	2.54	-10.08	#	#	#	-14.06
15	AP_57	Arunachal Pradesh	03_82O_064	WB	44.06	-1.50	10.08	#	18.02	-0.14	-8.15
16	AP_67	Arunachal Pradesh	03_82P_010	WB	99.22	-10.91	-16.35	#	16.91	5.83	-0.49
17	AP_77	Arunachal Pradesh	03_83A_012	WB	62.59	-10.52	-20.11	5.46	24.63	#	-6.21
18	AP_84	Arunachal Pradesh	03_91C_034	WB	134.28	4.26	19.90	#	#	#	-3.96
19	AP_85	Arunachal Pradesh	03_91C_038	WB	113.26	-9.59	-16.12	-27.60	#	#	-33.04
20	AP_87	Arunachal Pradesh	03_91C_040	WB	94.23	-15.90	-8.73	-5.55	#	#	-15.84
21	AP_89	Arunachal Pradesh	03_91C_042	WB	50.43	-1.65	1.13	#	#	#	-16.26
22	AP_90	Arunachal Pradesh	03_91C_044	WB	62.65	2.47	0.56	#	18.12	#	-4.93
23	AP_91	Arunachal Pradesh	03_91C_045	WB	112.98	-7.77	-7.06	#	0.90	-6.09	-2.59
24	AP_92	Arunachal Pradesh	03_91C_046	WB	60.70	-12.03	-14.33	-14.33	-1.15	#	-11.99
25	AP_95	Arunachal Pradesh	03_91C_049	WB	80.16	-13.17	-6.44	#	#	#	-48.18
26	HP_1	Himachal Pradesh	01_52D_001	WB	724.67	-12.93	3.47	10.95	16.83	24.87	20.46

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Table 2.9: Change in Water Spread Area of Glacial Lakes and Water Bodies Monitored by CWC
a) Glacial Lakes & Water Bodies with Water Spread Area more than 50 Ha

Sl. No.	UID	State Name	Lake_ID	Lake Type	Water Spread Area in Ha 2011(Inventory)	% Diff in Water Spread Area w.r.t. Inventory Area					
						2022	2021	2020	2019	2018	2017
1	2	3	4	5	6	7	8	9	10	11	12
27	HP_10	Himachal Pradesh	01_53A_002	WB	10255.95	#	-34.03	15.69	35.52	31.12	18.61
28	HP_12	Himachal Pradesh	01_53E_001	WB	71.77	1.44	17.60	42.12	76.26	80.47	18.81
29	HP_3	Himachal Pradesh	01_52H_002	GL	61.66	60.56	51.48	57.85	67.45	68.01	46.45
30	HP_5	Himachal Pradesh	01_52H_004	GL	46.47	241.62	202.35	222.79	231.83	227.52	146.77
31	HP_6	Himachal Pradesh	01_52H_005	WB	45.48	8.62	-18.21	-5.45	9.50	5.72	-23.01
32	HP_9	Himachal Pradesh	01_53A_001	WB	16946.16	-3.24	-20.31	19.33	29.09	31.29	-16.79
33	JK_1	Ladakh (POK)	01_42H_001	WB	276.13	-3.23	-6.81	1.40	0.92	-2.43	-5.29
34	JK_100	Jammu & Kashmir	01_43J_022	WB	59.63	-6.76	3.64	3.97	17.39	3.44	8.78
35	JK_111	Jammu & Kashmir	01_43K_010	WB	66.22	-1.24	-24.49	8.73	14.77	3.83	-32.25
36	JK_115	Jammu & Kashmir	01_43K_014	WB	111.32	21.81	11.09	29.36	29.18	35.96	26.06
37	JK_120	Ladakh (POK)	01_43M_003	WB	187.36	-7.13	15.82	24.49	13.68	18.15	28.78
38	JK_128	Ladakh (POK)	01_43N_001	WB	127.24	1.70	-11.98	-3.33	4.92	0.24	-3.15
39	JK_147	Jammu & Kashmir (POK)	01_43N_020	WB	61.03	3.56	-17.25	9.78	13.61	1.70	-2.85
40	JK_149	Jammu & Kashmir (POK)	01_43N_022	WB	73.41	-1.10	-16.00	3.98	2.17	-3.25	5.43
41	JK_154	Jammu & Kashmir	01_43N_027	WB	47.67	-3.08	-11.89	-0.36	-4.03	-2.76	-15.57
42	JK_157	Jammu & Kashmir	01_43N_030	WB	86.20	2.09	-29.23	-10.09	-5.74	0.93	-5.78
43	JK_159	Jammu & Kashmir	01_43N_032	WB	49.49	12.75	10.73	18.71	23.26	33.34	22.70
44	JK_167	Jammu & Kashmir	01_43P_002	WB	51.97	4.29	-4.75	8.72	15.93	22.45	17.74
45	JK_187	Ladakh	01_52C_003	GL	44.66	24.94	17.00	33.23	44.65	57.77	24.64
46	JK_188	Ladakh	01_52E_001	GL	51.01	-97.39	#	-81.05	#	#	#
47	JK_189	Ladakh	01_52G_001	WB	44.52	-6.56	-21.38	-2.29	7.82	11.61	-4.13
48	JK_191	Ladakh	01_52G_003	WB	1473.34	-15.77	-50.74	-1.43	2.76	6.68	-6.53
49	JK_195	Ladakh	01_52I_003	WB	179.62	-8.03	0.77	16.77	27.21	28.44	-15.11
50	JK_196	Ladakh	01_52I_004	WB	123.50	#	#	-59.92	-33.81	-12.13	-44.55
51	JK_197	Ladakh	01_52J_001	GL	65.40	49.54	35.32	53.29	56.73	50.60	40.54

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Table 2.9: Change in Water Spread Area of Glacial Lakes and Water Bodies Monitored by CWC
a) Glacial Lakes & Water Bodies with Water Spread Area more than 50 Ha

Sl. No.	UID	State Name	Lake_ID	Lake Type	Water Spread Area in Ha 2011(Inventory)	% Diff in Water Spread Area w.r.t. Inventory Area					
						2022	2021	2020	2019	2018	2017
1	2	3	4	5	6	7	8	9	10	11	12
52	JK_198	Ladakh	01_52J_002	WB	66.88	-3.11	-26.73	-11.78	-0.94	1.75	-10.25
53	JK_201	Ladakh	01_52J_005	WB	43.74	1.97	-11.98	1.17	15.84	7.60	-3.80
54	JK_202	Ladakh	01_52J_006	WB	110.20	-4.54	-16.97	-2.00	-1.77	4.50	-9.92
55	JK_205	Ladakh	01_52J_009	WB	57.24	2.03	-40.60	1.91	29.28	21.79	-8.97
56	JK_212	Ladakh	01_52K_004	WB	5740.70	1.09	0.78	1.81	2.04	1.48	0.39
57	JK_217	Ladakh	01_52K_009	WB	203.76	-4.59	-16.47	-4.63	0.85	2.45	-1.23
58	JK_218	Ladakh	01_52K_010	WB	152.36	0.95	-19.05	-12.05	-0.67	4.00	-8.68
59	JK_219	Ladakh	01_52K_011	WB	185.71	-8.46	-12.36	-6.13	0.87	-2.64	-5.95
60	JK_22	Ladakh (POK)	01_43A_001	WB	202.84	-0.51	-0.25	10.92	3.90	4.84	-0.49
61	JK_220	Ladakh	01_52K_012	WB	166.07	-1.49	-11.48	-5.16	-0.04	-2.51	-3.24
62	JK_222	Ladakh	01_52K_014	WB	404.76	13.30	-9.87	4.94	14.19	11.04	-8.29
63	JK_224	Ladakh	01_52K_016	WB	507.38	3.00	-1.53	0.58	-14.42	6.46	4.03
64	JK_225	Ladakh	01_52L_001	WB	14139.33	-1.54	-1.12	0.15	1.39	1.30	0.04
65	JK_226	Ladakh	01_52L_002	WB	441.72	-2.29	-10.49	-4.09	1.25	0.85	-5.51
66	JK_227	Ladakh	01_52L_003	WB	648.50	-19.26	-21.42	-17.42	-7.88	-5.55	-8.02
67	JK_23	Ladakh (POK)	01_43A_002	WB	91.21	1.74	5.25	15.48	20.87	24.88	12.09
68	JK_3	Ladakh (POK)	01_42H_003	WB	123.70	-14.31	-15.52	-6.63	-4.07	-12.85	-18.73
69	JK_30	Ladakh (POK)	01_43E_006	WB	70.95	-5.00	-18.60	1.48	0.07	-4.16	-14.17
70	JK_47	Ladakh (POK)	01_43E_023	WB	86.06	-7.74	-12.46	6.32	8.65	-0.07	-11.04
71	JK_5	Jammu & Kashmir	01_42H_005	WB	72.56	-26.41	-14.09	-22.82	-14.00	-17.63	-13.56
72	JK_67	Jammu & Kashmir (POK)	01_43G_001	WB	14988.52	-1.80	2.08	81.24	60.55	78.54	51.48
73	JK_82	Jammu & Kashmir (POK)	01_43J_004	WB	59.10	4.57	4.34	13.37	24.37	28.65	11.59
74	JK_85	Jammu & Kashmir (POK)	01_43J_007	WB	95.00	-1.26	-5.79	71.58	22.11	0.70	-33.06
75	JK_95	Jammu & Kashmir	01_43J_017	WB	164.47	-4.06	-6.52	-5.45	1.13	-1.60	-6.38

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Table 2.9: Change in Water Spread Area of Glacial Lakes and Water Bodies Monitored by CWC
a) Glacial Lakes & Water Bodies with Water Spread Area more than 50 Ha

Sl. No.	UID	State Name	Lake_ID	Lake Type	Water Spread Area in Ha 2011(Inventory)	% Diff in Water Spread Area w.r.t. Inventory Area					
						2022	2021	2020	2019	2018	2017
1	2	3	4	5	6	7	8	9	10	11	12
76	JK_98	Jammu & Kashmir	01_43J_020	WB	191.26	-14.04	-13.94	-14.64	-6.83	-13.81	-11.13
77	JK_99	Jammu & Kashmir	01_43J_021	WB	1238.39	-22.96	-29.06	-31.12	-18.85	-11.81	-14.83
78	SK_11	Sikkim	03_78A_003	GL	57.55	-17.64	-23.55	9.46	32.92	223.18	223.56
79	SK_16	Sikkim	03_78A_009	GL	54.89	10.40	3.84	8.40	28.44	22.94	12.13
80	SK_19	Sikkim	03_78A_013	GL	66.59	15.94	14.13	13.63	40.41	39.66	20.05
81	SK_2	Sikkim	03_77D_002	GL	104.31	5.65	-12.28	-1.25	14.80	7.19	-17.18
82	SK_20	Sikkim	03_78A_014	GL	122.98	29.13	20.62	21.16	26.85	21.96	6.18
83	SK_26	Sikkim	03_78A_021	GL	56.17	52.04	30.86	32.64	37.09	-39.47	-39.63
84	SK_3	Sikkim	03_77D_003	WB	83.58	8.88	-7.87	19.05	44.77	29.84	-16.04
85	SK_4	Sikkim	03_77D_004	GL	106.23	14.46	10.13	9.19	34.14	28.65	10.02
86	SK_5	Sikkim	03_77D_005	GL	88.47	13.71	5.69	14.73	22.83	20.80	-37.33
87	SK_8	Sikkim	03_77D_008	GL	46.10	-5.86	-42.52	-11.07	4.66	10.63	20.75
88	SK_9	Sikkim	03_78A_001	GL	155.72	18.29	5.64	15.27	26.94	23.30	239.88
89	UK_1	Uttarakhand	02_53K_001	WB	3879.59	30.78	30.15	54.96	44.83	45.96	18.24
90	UK_11	Uttarakhand	02_53P_003	WB	1077.58	-30.73	-43.97	-16.39	-8.41	-0.12	-28.14
91	UK_2	Uttarakhand	02_53K_002	WB	1597.38	-53.30	-55.88	-41.47	-21.64	-11.69	-46.46
92	UK_4	Uttarakhand	02_53O_001	WB	45.61	-16.68	-9.01	-10.11	20.59	-12.30	-53.03
93	UK_8	Uttarakhand	02_53O_005	WB	1510.21	-41.13	-38.54	-39.54	-14.20	23.62	-15.89
94	UK_9	Uttarakhand	02_53P_001	WB	2053.55	-37.09	-40.62	-15.32	-16.74	-0.14	-23.08

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

Note 1: '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 toposheet. The last three digit number indicates lake number within a grid of 1:250,000 SOI toposheet.
Note 2: '#': indicates cloud covered, frozen/ dried lakes; 'GL': Glacial Lake; 'WB': Water Bodies.

Table 2.9: Change in Water Spread Area of Glacial Lakes and Water Bodies Monitored by CWC
b) Glacial Lakes with Water Spread Area between 10 Ha to 50 Ha

Sl. No.	State	Lake ID	Lake Type	Average 2022 (Ha)	Inventory 2011 (Ha)	% Difference of Annual Average Area of 2022 w.r.t Inventory Area 2011
1	Jammu & Kashmir	98	GL	2.75	-	#
2	Jammu & Kashmir	976	GL	16.00	-	#
3	Ladakh	173	GL	6.00	-	#
4	Jammu & Kashmir	963	GL	28.40	-	#
5	Jammu & Kashmir	1037	GL	38.80	-	#
6	Uttarakhand	2147	GL	0.33	-	#
7	Sikkim	260	GL	39.60	-	#
8	Sikkim	292	GL	3.80	-	#
9	Sikkim	312	GL	6.60	-	#
10	Sikkim	345	GL	18.40	-	#
11	Sikkim	515	GL	8.00	-	#
12	Sikkim	569	GL	26.40	-	#
13	Sikkim	256	GL	15.40	-	#
14	Jammu & Kashmir	27	GL	12.60	-	#
15	Ladakh	180	GL	7.20	-	#
16	Jammu & Kashmir	182	GL	7.50	-	#
17	Jammu & Kashmir	931	GL	17.80	-	#
18	Jammu & Kashmir	938	GL	20.80	-	#
19	Jammu & Kashmir	951	GL	14.60	-	#
20	Jammu & Kashmir	958	GL	3.60	-	#
21	Jammu & Kashmir	993	GL	7.60	-	#
22	Jammu & Kashmir	1014	GL	4.40	-	#
23	Jammu & Kashmir	1032	GL	1.00	-	#
24	Ladakh	1360	GL	8.80	-	#
25	Himachal Pradesh	1774	GL	7.00	-	#
26	Himachal Pradesh	1805	GL	2.40	-	#
27	Himachal Pradesh	1847	GL	13.25	-	#
28	Himachal Pradesh	1936	GL	2.75	-	#
29	Himachal Pradesh	1998	GL	0.75	-	#
30	Himachal Pradesh	2031	GL	10.40	-	#
31	Uttarakhand	2108	GL	16.80	-	#
32	Uttarakhand	2207	GL	9.60	-	#
33	Uttarakhand	2299	GL	#	-	#
34	Sikkim	227	GL	54.20	-	#
35	Sikkim	293	GL	2.20	-	#
36	Sikkim	295	GL	6.40	-	#
37	Sikkim	298	GL	5.20	-	#
38	Sikkim	599	GL	6.50	-	#
39	Arunachal Pradesh	129	GL	9.00	-	#
40	Sikkim	237	GL	8.00	-	#
41	Uttarakhand	02_53N_001	GL	21.80	20.86	4.51
42	Uttarakhand	02_62B_004	GL	18.40	18.68	-1.50
43	Uttarakhand	02_62B_005	GL	8.60	12.38	-30.53
44	Uttarakhand	02_62B_007	GL	#	18.77	#
45	Ladakh	01_42H_002	GL	16.00	12.85	24.51
46	Jammu & Kashmir	01_43J_003	GL	15.00	20.27	-26.00
47	Ladakh	01_52A_002	GL	21.00	23.25	-9.68

Contd…

Table 2.9: Change in Water Spread Area of Glacial Lakes and Water Bodies Monitored by CWC
b) Glacial Lakes with Water Spread Area between 10 Ha to 50 Ha

Sl. No.	State	Lake ID	Lake Type	Average 2022 (Ha)	Inventory 2011 (Ha)	% Difference of Annual Average Area of 2022 w.r.t Inventory Area 2011
48	Ladakh	01_52A_003	GL	16.00	23.95	-33.19
49	Ladakh	01_52B_012	GL	12.75	16.82	-24.20
50	Ladakh	01_52C_001	GL	53.60	35.85	49.51
51	Jammu & Kashmir	01_52C_002	GL	42.20	26.28	60.58
52	Himachal Pradesh	01_52H_003	GL	123.40	27.80	343.88
53	Ladakh	01_52L_006	GL	9.40	12.46	-24.56
54	Ladakh	01_52L_007	GL	29.75	31.80	-6.45
55	Uttarakhand	01_62B_003	GL	12.00	12.49	-3.92
56	Sikkim	03_78A_008	GL	18.60	44.17	-57.89
57	Ladakh	01_52A_004	GL	10.00	10.53	-5.03
58	Ladakh	01_52B_010	GL	14.25	18.39	-22.51
59	Himachal Pradesh	01_53I_002	GL	28.25	22.66	24.67
60	Arunachal Pradesh	03_82L_007	GL	15.80	16.11	-1.92
61	Arunachal Pradesh	03_91C_026	GL	22.75	27.76	-18.05
62	Arunachal Pradesh	03_91D_075	GL	21.50	22.91	-6.15
63	Arunachal Pradesh	03_91H_073	GL	24.00	25.10	-4.38
64	Sikkim	03_78A_005	GL	12.60	11.34	11.12
65	Sikkim	03_78A_006	GL	14.20	11.10	27.89
66	Sikkim	03_78A_023	GL	24.20	32.97	-26.60
67	Sikkim	03_78A_026	GL	10.20	10.87	-6.12
68	Sikkim	03_78A_031	GL	11.80	13.87	-14.90
69	Sikkim	03_78A_035	GL	10.00	-	#
70	Sikkim	03_78A_010	GL	32.20	35.76	-9.96
71	Sikkim	03_78A_012	GL	28.80	26.16	10.08
72	Sikkim	03_78A_016	GL	10.20	13.69	-25.51
73	Sikkim	03_78A_017	GL	27.25	19.10	42.69
74	Sikkim	03_78A_020	GL	14.40	13.97	3.08
75	Arunachal Pradesh	03_83A_003	GL	81.60	24.14	238.03
76	Arunachal Pradesh	03_83A_004	GL	17.00	17.10	-0.59
77	Arunachal Pradesh	03_83A_005	GL	12.20	12.61	-3.25
78	Arunachal Pradesh	03_83A_007	GL	14.20	13.87	2.41
79	Sikkim	03_77D_006	GL	21.60	22.47	-3.89
80	Sikkim	03_77D_007	GL	24.20	23.70	2.12
81	Sikkim	03_78A_002	GL	37.40	22.00	70.01
82	Sikkim	03_78A_007	GL	17.00	17.22	-1.30
83	Sikkim	03_78A_027	GL	33.20	33.29	-0.28
84	Sikkim	03_78A_015	GL	9.20	11.91	-22.77
85	Sikkim	03_78A_019	GL	10.20	14.76	-30.92

Source: Morphology & Climate Change Directorate, Central Water Commission, M/o Jal Shakti
Remarks: Monitoring of above 425 Glacial Lakes were initiated in the year 2022.
Note 1: '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 toposheet. The last three digit number indicates lake number within a grid of 1:250,000 SOI toposheet; '-': indicates Inventory data Not Available; '#': indicates cloud covered, frozen/dried lakes; 'GL': Glacial Lake; 'WB': Water Bodies.

Table 2.10: State-wise Distribution of Hydro-Meteorological Observations Sites of CWC

(as on January, 2023)

Sl. No.	Name of States/UTs	Type of Site								
		G	GD	GDQ	GDS	GDSQ	GQ	Excl.Met	WQSS	Total
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	8	17	4	-	14	1	-	2	46
2	Arunachal Pradesh	7	3	9	-	9	10	18	-	56
3	Assam	7	9	21	-	26	53	5	-	121
4	Bihar	61	27	6	2	22	1	-	-	119
5	Chhattisgarh	11	9	2	1	18	-	3	12	56
6	Dadar & Nagar Haveli and Daman & Diu	3	1	-	-	-	-	-	-	4
7	Delhi	-	-	1	-	2	-	-	3	6
8	Goa	-	2	-	-	-	-	-	-	2
9	Gujarat	20	16	4	-	9	-	1	2	52
10	Haryana	3	3	3	-	1	-	-	-	10
11	Himachal Pradesh	5	11	-	4	6	-	5	-	31
12	Jammu & Kashmir	10	5	3	4	6	-	1	-	29
13	Jharkhand	10	20	4	-	6	1	2	6	49
14	Karnataka	4	18	17	-	23	2	-	-	64
15	Kerala	-	14	2	-	24	-	-	-	40
16	Ladakh	8	2	-	-	-	-	-	-	10
17	Madhya Pradesh	55	44	20	-	24	4	4	12	163
18	Maharashtra	31	32	17	1	25	4	11	6	127
19	Manipur	-	1	-	-		1	-	-	2
20	Meghalaya	4	5	5	1	3	1	-	-	19
21	Mizoram	1	16	-	5	5	-	2	-	29
22	Odisha	49	7	2	-	22	1	4	25	110
23	Puducherry	-	-	3	-	-	-	-	-	3
24	Punjab	-	-	-	4	-	-	-	-	4
25	Rajasthan	15	6	8	-	8	-	1	2	40
26	Sikkim	-	-	-	-	11	6	2	5	24
27	Tamil Nadu	-	20	21	-	21	-	-	-	62
28	Telangana	10	11	4	-	8	1	1	-	35
29	Tripura	1	5	-	3	3	2	-	-	14
30	Uttar Pradesh	70	41	14	1	47	4	-	28	205
31	Uttarakhand	26	27	5	6	9	-	18	15	106
32	West Bengal	18	22	7	2	21	10	3	7	90
Grand Total		**437**	**394**	**182**	**34**	**373**	**102**	**81**	**125**	**1728**

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; 'Excl. Met': Exclusive Meteorological; 'WQSS': Water Quality Sampling Station.

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

(as on January, 2023)

Sl. No	Basin Name	G	GD	GDQ	GDS	GDSQ	GQ	Excl. Met	WQSS	Total
1	2	3	4	5	6	7	8	9	10	11
1.	Barak and other Basins	6	24	6	6	18	7	2	-	69
2.	Brahmani & Baitarni Basin	12	-	-	-	11	1	1	15	40
3.	Brahmaputra Basin	12	7	34	-	44	76	25	9	207
4.	Cauvery Basin	-	13	17	-	24	-	-	-	54
5.	East Flowing Rivers between Pennar and Cauvery	-	17	8	-	4	-	-	-	29
6.	East Flowing Rivers between Krishna and Pennar	-	1	-	-	1	-	-	-	2
7.	East Flowing Rivers between Mahanadi and Godavari	13	1	-	-	4	-	-	5	23
8.	East Flowing Rivers between South of Cauvery	-	2	2	-	4	-	-	-	8
9.	Ganga Basin	226	151	48	12	115	6	25	54	637
10.	Godavari Basin	46	42	19	-	26	4	9	6	152
11.	Indus (up to International border) Basin	21	15	3	12	8	-	4	-	63
12.	Krishna Basin	7	14	14	-	27	3	-	-	65
13.	Mahanadi Basin	30	2	1	-	22	-	6	15	76
14.	Mahi Basin	8	4	2	-	3	-	2	-	19
15.	Narmada Basin	15	33	8	-	11	4	2	11	84
16.	Pennar Basin	-	4	4	-	4	-	-	-	12
17.	Rivers draining into Bangladesh Basin	1	4	-	-	1	-	-	-	6
18.	Rivers draining into Myanmar Basin	1	4	-	3	2	-	-	-	10
19.	Sabarmati Basin	7	4	1	-	1	-	-	1	14
20.	Subarnarekha Basin	6	2	1	-	6	-	-	8	23
21.	Tapi Basin	16	18	1	1	3	-	2	-	41
22.	West Flowing Rivers of Kutch & Saurashtra including Luni Basin	3	10	2	-	3	-	-	-	18
23.	West Flowing Rivers from South of Tapi	7	22	11	-	31	1	3	1	76
Grand Total		**437**	**394**	**182**	**34**	**373**	**102**	**81**	**125**	**1728**

Source: RDC-2 Directorate, CWC, M/o Jal Shakti

Note: 'G': Gauge; 'GQ': Gauge and Water Quality; 'GD': Gauge and Discharge; 'GDS': Gauge, Discharge & Sediment; 'GDQ': Gauge, Discharge & Water Quality; 'GDSQ': Gauge, Discharge, Sediment and Water Quality; 'Exl. Met': Exclusive Meteorological; '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 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 6mg/l or more 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 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 5mg/l or more 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 2. pH between 6 and 9 3. Dissolved Oxygen 4mg/l or more 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 2. Dissolved Oxygen 4mg/l or more 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 2. Electrical Conductivity at 25 °C micro mhos/cm, maximum 2250 3. Sodium absorption Ratio Max. 26 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.'

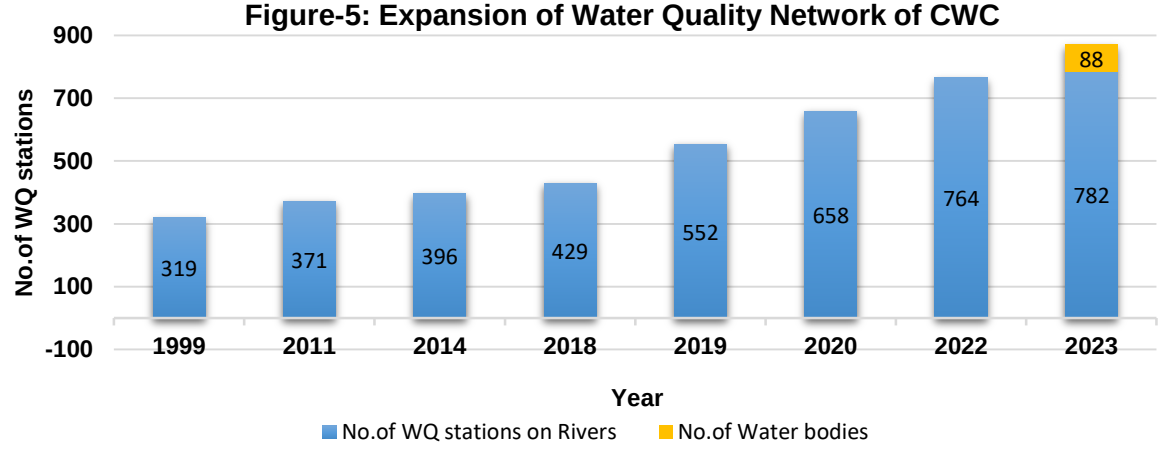
2.3 Water Quality Monitoring Activities of CWC during 2023

i. Being the apex national body for development of water resources in the country, water quality monitoring activities of CWC in the year 2023 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 2023, Central Water Commission is observing water quality at 782 key locations covering important river basins of India following 'Guidelines of Water Quality Monitoring, 2017' published by Water Quality Assessment Authority. In addition, CWC has started monitoring of water quality of water bodies across India since 01.03.2023. 88 water bodies have been identified for water quality monitoring purpose across various states of the country.

iii. From the 764 key locations in the year 2022, 18 more water quality monitoring locations on rivers 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	•427 labs at field WQ monitoring stations •06 in-situ parameters (Colour, Odour, Temperature pH, Electrical Conductivity and Dissolved Oxygen)
Level-II	•18 labs located at division offices •NABL Accreditation for 14 labs •25 physico-chemical and bacteriological parameters
Level-III	•5 regional labs (All NABL Accredited) •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 2023, one (01) WQ laboratories of CWC located at Haridwar (Uttarakhand) received NABL accreditation bringing 20 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 Colour Odour pH Dissolved Oxygen Electrical Conductivity Total= 06 Nos.	Temperature Electrical Conductivity Total Dissolved Solids pH Dissolved Oxygen (DO) Biochemical Oxygen Demand Chemical Oxygen Demand Turbidity Ammonia Sodium Calcium Magnesium Potassium Boron Carbonate Bicarbonate Fluoride Chloride Sulphate Nitrate Nitrite Silicate Phosphate Total Coliform Fecal Coliform Total= 25 Nos.	*Level-II Parameters (25 nos.)* *Trace & Toxic metals (9 nos.)* Arsenic Cadmium Chromium Copper Lead Iron Mercury Nickel Zinc *Pesticides (7 nos.)* Alpha, Beta or Gamma BHC O,P' and P,P' DDT Aldrin, Dieldrin Alpha and Beta Endosulfan Carbaryl (Carbamate) Malathion, 2-4 D, Methyl Parathion Anilophos, Chlorpyrifos Total= 25+16= 41 Nos.

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

2.4 The Dam Safety Act, 2021

i. The Dam Safety Act, 2021 has been enacted by the Parliament and notified in the Gazette of India by Ministry of Law and Justice (Legislative Department) as The Dam Safety Act, 2021 No.41 of 2021 on 14th Dec, 2021; and vide M/o Jal Shakti, D/o WR, RD&GR Gazette Notification-S.O. 5422(E) 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. After the enactment of Dam safety Act, 2021, the Ministry of Jal Shakti vide Gazette notifications S.O. 757(E) dated 17.02.2022 and per Section 5(1) of the Dam Safety Act constituted the National Committee on Dam Safety (NCDS). Subsequently, vide Gazette notifications G.S.R. 134(E) dated 17.02.2022, the Ministry of Jal Shakti, notified NCDS (Procedures, Allowance and Other Expenditure) Rules, 2022.

iii. The Ministry of Jal Shakti, vide Gazette notifications S.O. 758(E) dated 17.02.2022 and per Section 8(1) of the Dam Safety Act, established National Dam Safety Authority (NDSA) and vide Gazette notifications G.S.R. 135(E) dated 17.02.2022 notified NDSA (Functions and Powers) Rules, 2022.

iv. This Act provide the surveillance, inspection, operation and maintenance of the specified dam for the prevention of dam failure-related disasters and to provide for institutional mechanisms to ensure their safe functioning and for matters connected therewith or incidental thereto:

(i) The union should take under its control the regulation of uniform dam safety procedures for specified dams to the extent hereinafter provided.

(ii) Two-tier structure- consultative (NCDS & SCDS) and implementation (NDSA & SDSO) at Union and State levels

(iii) Statutory establishment of National Committee on Dam Safety Consultative mechanism for all the major owners of dams and other expert organizations, providing guidance for working with other mechanisms for implementation of dam safety activities.

(iv) Establishment of National Dam Safety Authority and extension of its jurisdiction over the whole of India looking after the implementation of the act, acting as a regulatory and quality assurance agency for capacities and competencies, and direction to the dam safety programs at various units.

(v) Establishment of surveillance processes and undertake follow-up action thereafter.

(vi) Undertake dam inspections at different levels of detail and expertise.

(vii) Prepare a database of experts for dam safety purposes.

(viii) Earmarking of funds for repair & maintenance of dams

(ix) Minimum number of instrumentations at dams

(x) Develop standard procedures for various structures and components for bringing the inspections on a common technical and managerial baseline. Important topics are:

a) Safety, Inspection, and Data Collection
b) Emergency Action Plan and Disaster Management
c) Operation & Maintenance Manual
d) Comprehensive Dam Safety Evaluation.

(xi) Revise operating protocols for providing additional requirements for ensuring safety during the dam operational regime.

(xii) The owner of the dam is primarily responsible for implementing the required procedures and practices for dam safety, mobilizing required resources, and providing for continued surveillance.

(xiii) State(s) have been entrusted with the supervision and enforcement functions for implementing the provisions of the act. Support in the form of a State-Level Dam Safety Committee is provided.

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

(xv) National-level implementation of the act is the responsibility of the National Dam Safety Authority.

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 17th 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 31st 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

i. Based on the success of DRIP Phase-I, Ministry of Jal Shakti initiated another externally funded scheme, DRIP Phase-II and Phase-III. The scheme has provision for rehabilitation of 736 dams located in 19 States (Andhra Pradesh, Chhattisgarh, Goa, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand, West Bengal and three Central Agencies (Central Water Commission, Bhakra Beas Management Board and Damodar Valley Corporation). 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. It is a State Sector Scheme with Central component, 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 loan agreement by World Bank was signed on August 04, 2021 with 10 States (Gujarat, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Rajasthan, Odisha, Tamil Nadu and Chhattisgarh) and became effective from 12th October, 2021. Subsequently, the World Bank has also signed loan agreement with the four States (Uttarakhand, Uttar Pradesh, West Bengal and Karnataka) in June, 2022.

ii. The loan agreement by AIIB was signed on 19th May, 2022 with 10 States (Gujarat, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Rajasthan, Odisha, Tamil Nadu and Chhattisgarh) and declared effective on 29th December, 2022 by AIIB.

iii. 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

iv. Project 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

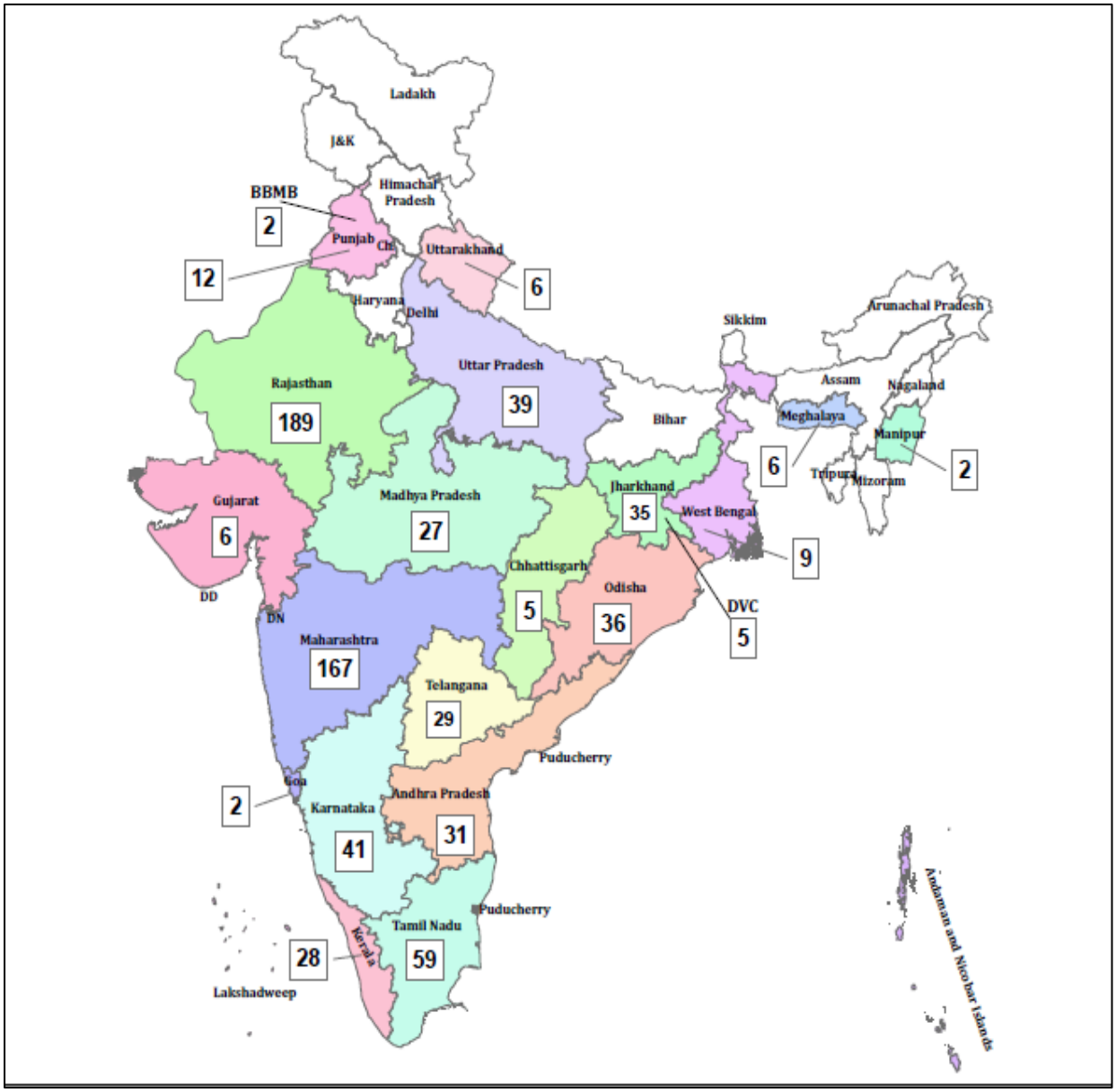
v. Funding Pattern: It is a State Sector Scheme with Central component. The Scheme has 100% back to back loan arrangement for States. Funding pattern for [loan: counterpart budget] Phase-II and Phase-III of DRIP is varying from 50% to 80% depending upon the category of the agency, as funding pattern proposed is 50:50 for the Central agencies, 80:20 for the Special Category of States and 70:30 for other States. The Scheme also has provision of Central Grant of 90% of loan amount for special category States (Manipur, Meghalaya and Uttarakhand).

vi. Cost and Funding: The contract(s) for about Rs 1648 Cr have been awarded by various Implementing Agencies. An expenditure of Rs. 498 Cr has been incurred in the scheme so far and loan disbursed by the bank is US$ 44 Million.

2.4.5 International Centre of Excellence for Dams

IIT Roorkee: A Memorandum of Agreement (MoA) was signed on 14.02.2023 between CWC and IIT Roorkee for Development of International Centre of Excellence for Dams (ICED) at IIT Roorkee at the cost of Rs. 108.99 Cr. The establishment of ICED was one of the major goals of D/o Water Resources, RD&GR for the financial year 2022-23. The Centre will focus on the two focused areas: Reservoir Sedimentation and Seismic Hazard Mapping and Analysis in the initial years. The new areas shall be added as per the need in the implementation of Dam Safety Act, 2021. In the long run, the Centre shall deal with the complete life cycle of the dams. ICED will act as a technological arm of the Central Water Commission (CWC), D/o Water Resources, RD&GR, M/o Jal Shakti, to provide specialized technical support in investigations, modelling, research and innovations, and technical support services for the Indian and overseas dam owners.

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	Andhra Pradesh	140	24	164
2	Arunachal Pradesh	1	3	4
3	Assam	3	2	5
4	Bihar	27	1	28
5	Chhattisgarh	339	7	346
6	Goa	5	-	5
7	Gujarat	487	4	491
8	Haryana	1	-	1
9	Himachal Pradesh	23	6	29
10	Jharkhand	55	24	79
11	Karnataka	231	-	231
12	Kerala	61	-	61
13	Madhya Pradesh	1354	-	1354
14	Maharashtra	2333	41	2374
15	Manipur	3	1	4
16	Meghalaya	8	1	9
17	Mizoram	1	-	1
18	Nagaland	1	-	1
19	Odisha	210	-	210
20	Punjab	18	1	19
21	Rajasthan	310	4	314
22	Sikkim	2	-	2
23	Tamil Nadu	127	-	127
24	Telangana	161	13	174
25	Tripura	1	-	1
26	Uttar Pradesh	151	4	155
27	Uttarakhand	32	5	37
28	West Bengal	36	-	36
Union Territories				
1	Andaman & Nicobar Islands	2	-	2
2	Chandigarh	-	-	-
3	Dadra and Nagar Haveli	-	-	-
4	Daman and Diu	-	-	-
5	Delhi	-	-	-
6	Jammu & Kashmir	13	2	15
7	Ladakh	2	-	2
8	Lakshadweep	-	-	-
9	Puducherry	-	-	-
Grand Total		**6138**	**143**	**6281**

Source: Dam Safety Monitoring Directorate, CWC/NRLD-2023

Note: 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

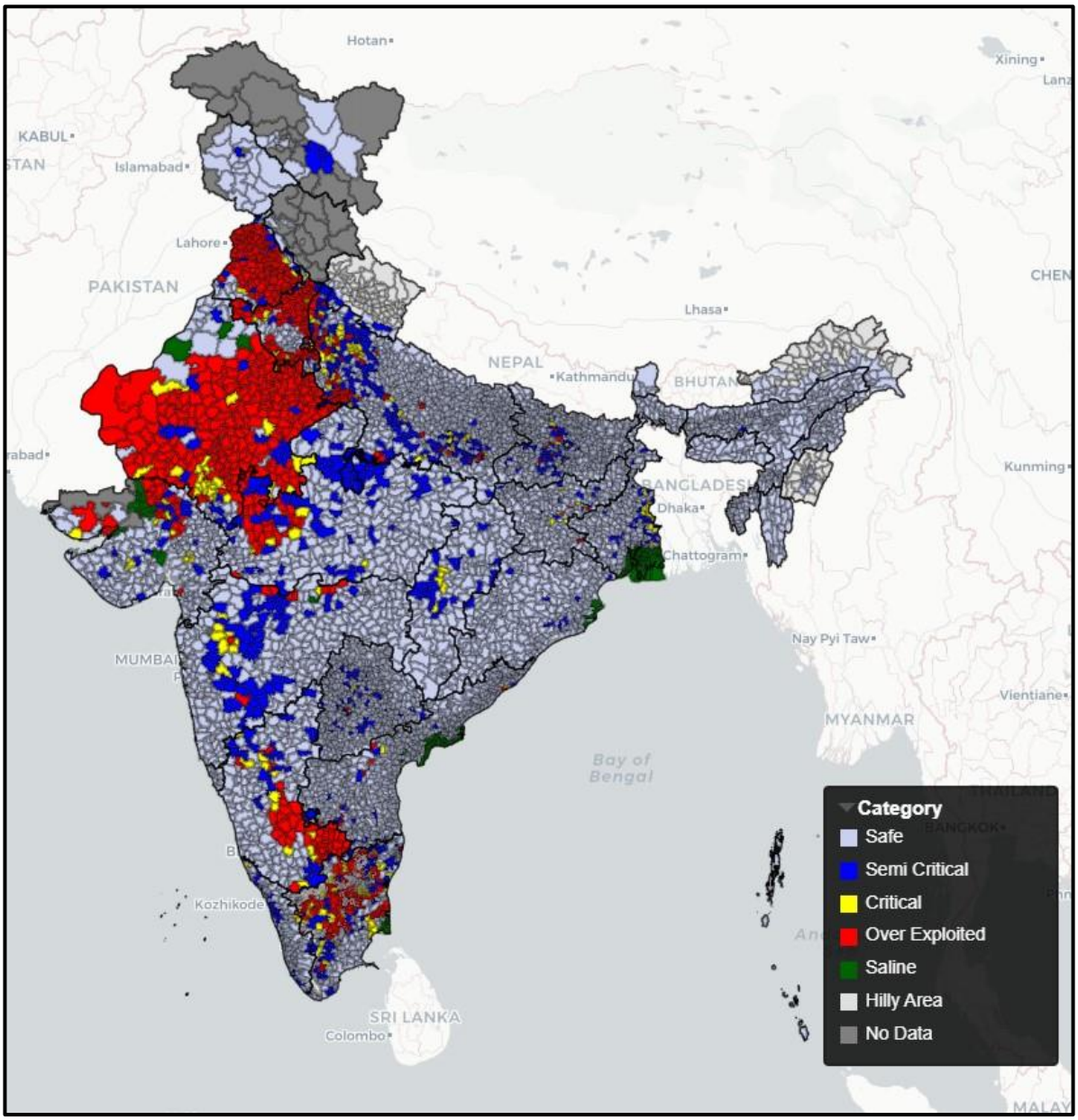
Sl. No.	Basin Name	Live Storage (in BCM)		
		Completed Projects	Under Construction Projects	Total
1	2	3	4	5
1	Indus	16.223	0.100	16.323
2	Ganga	48.677	7.649	56.326
3	Brahmaputra	1.718	0.795	2.513
4	Barak & others	0.719	9.172	9.891
5	Godavari	35.04	8.412	43.452
6	Krishna	50.651	4.156	54.807
7	Cauvery	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	13.06564	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 States as per Ground Water Resources Assessment (2023)



Source: Central Ground Water Board, D/o Water Resources, RD & GR, M/o Jal Shakti (https://cgwb.gov.in/cgwbpnm/public/uploads/documents/17056512151889452705file.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, Punjab, Rajasthan, Tamil Nadu, Dadra & Nagar Haveli and Daman & Diu.
3. The overall stage of groundwater extraction in the country is 59.26%. 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 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, 2023

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	597	89.5	18	2.7	3	0.5	10	1.5	39	5.85
2	Arunachal Pradesh	42	42	100	-	-	-	-	-	-	-	-
3	Assam	245	244	99.59	1	0.41	-	-	-	-	-	-
4	Bihar	535	467	87.29	53	9.91	7	1.31	8	1.5	-	-
5	Chhattisgarh	146	119	81.51	22	15.07	5	3.42	-	-	-	-
6	Goa	12	12	100	-	-	-	-	-	-	-	-
7	Gujarat	252	189	75	20	7.94	8	3.17	23	9.13	12	4.76
8	Haryana	143	35	24.48	9	6.29	11	7.69	88	61.54	-	-
9	Himachal Pradesh	10	10	100	-	-	-	-	-	-	-	-
10	Jharkhand	263	241	91.63	11	4.18	6	2.28	5	1.9	-	-
11	Karnataka	234	146	62.39	32	13.68	12	5.13	44	18.8	-	-
12	Kerala	152	119	78.29	30	19.74	3	1.97	-	-	-	-
13	Madhya Pradesh	317	226	71.29	60	18.93	5	1.58	26	8.2	-	-
14	Maharashtra	353	277	78.47	57	16.15	9	2.55	9	2.55	1	0.28
15	Manipur	9	9	100.00	-	-	-	-	-	-	-	-
16	Meghalaya	39	39	100	-	-	-	-	-	-	-	-
17	Mizoram	26	26	100	-	-	-	-	-	-	-	-
18	Nagaland	52	52	100	-	-	-	-	-	-	-	-
19	Odisha	314	299	95.22	9	2.87	-	-	-	-	6	1.91
20	Punjab	153	20	13.07	13	8.5	3	1.96	117	76.47	-	-
21	Rajasthan	302	38	12.58	22	7.28	23	7.62	216	71.52	3	0.99
22	Sikkim	6	6	100	-	-	-	-	-	-	-	-
23	Tamil Nadu	313	125	39.94	56	17.89	27	8.63	100	31.95	5	1.60
24	Telangana	612	530	86.60	61	9.97	10	1.63	11	1.80	-	-
25	Tripura	59	59	100	-	-	-	-	-	-	-	-
26	Uttar Pradesh	836	559	66.87	172	20.57	43	5.14	62	7.42	-	-

Contd…

Table 2.17: State/UT-wise Categorization of Assessment Units in India, 2023

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
27	Uttarakhand	18	14	77.78	4	22.22	-	-	-	-	-	-
28	West Bengal	345	241	69.86	32	9.28	12	3.48	-	-	60	17.39
UTs												
29	Andaman & Nicobar	9	9	100	-	-	-	-	-	-	-	-
30	Chandigarh	1	-	-	1	100	-	-	-	-	-	-
31	Dadra & Nagar Haveli and Daman & Diu	3	-	-	-	-	-	-	3	100	-	-
32	Delhi	34	5	14.71	4	11.76	12	35.29	13	38.24	-	-
33	Jammu & Kashmir	20	19	95	1	5	-	-	-	-	-	-
34	Ladakh	18	12	66.67	6	33.33	-	-	-	-	-	-
35	Lakshadweep	5	4	80	1	20	-	-	-	-	-	-
36	Puducherry	8	3	37.50	3	37.50	-	-	1	12.50	1	12.50
Grand Total		**6553**	**4793**	**73.14**	**698**	**10.65**	**199**	**3.04**	**736**	**11.23**	**127**	**1.94**

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

Note 1:

'Blocks': Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Haryana, Jharkhand, Kerala, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Tripura, Uttar Pradesh, Uttarakhand, West Bengal, Andaman & Nicobar Island, Ladakh, Lakshadweep

'Taluks': Goa, Gujarat, Karnataka, Maharashtra, Tamil Nadu, Puducherry;

'**Mandals'**: Andhra Pradesh, Telangana;

'District': Sikkim, Dadra & Nagar Haveli, Daman & Diu, Jammu & Kashmir;

'**Valley'**: Himachal Pradesh;

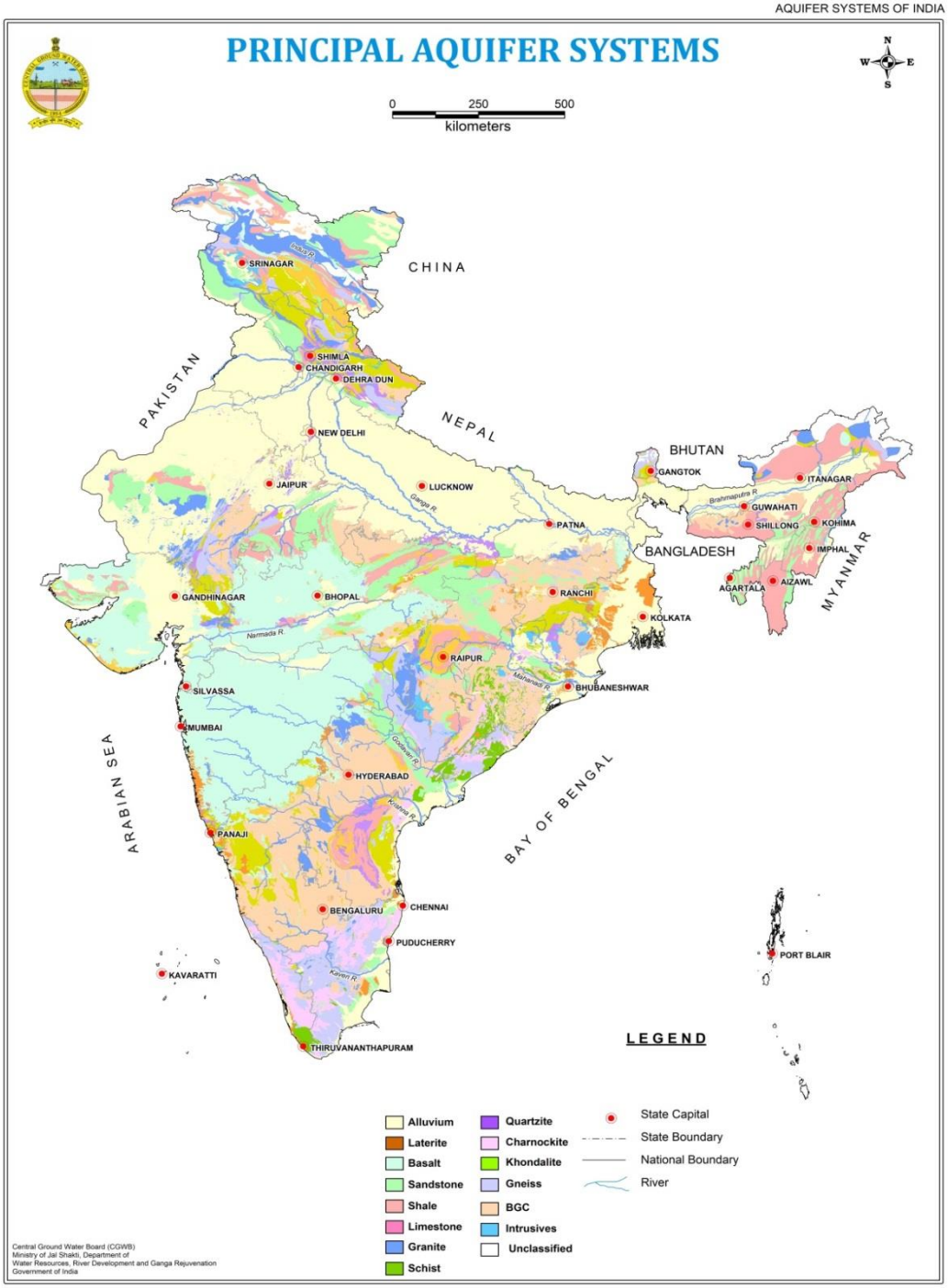
'UT': Chandigarh;

'**Tehsil**': Delhi.

Note 2:

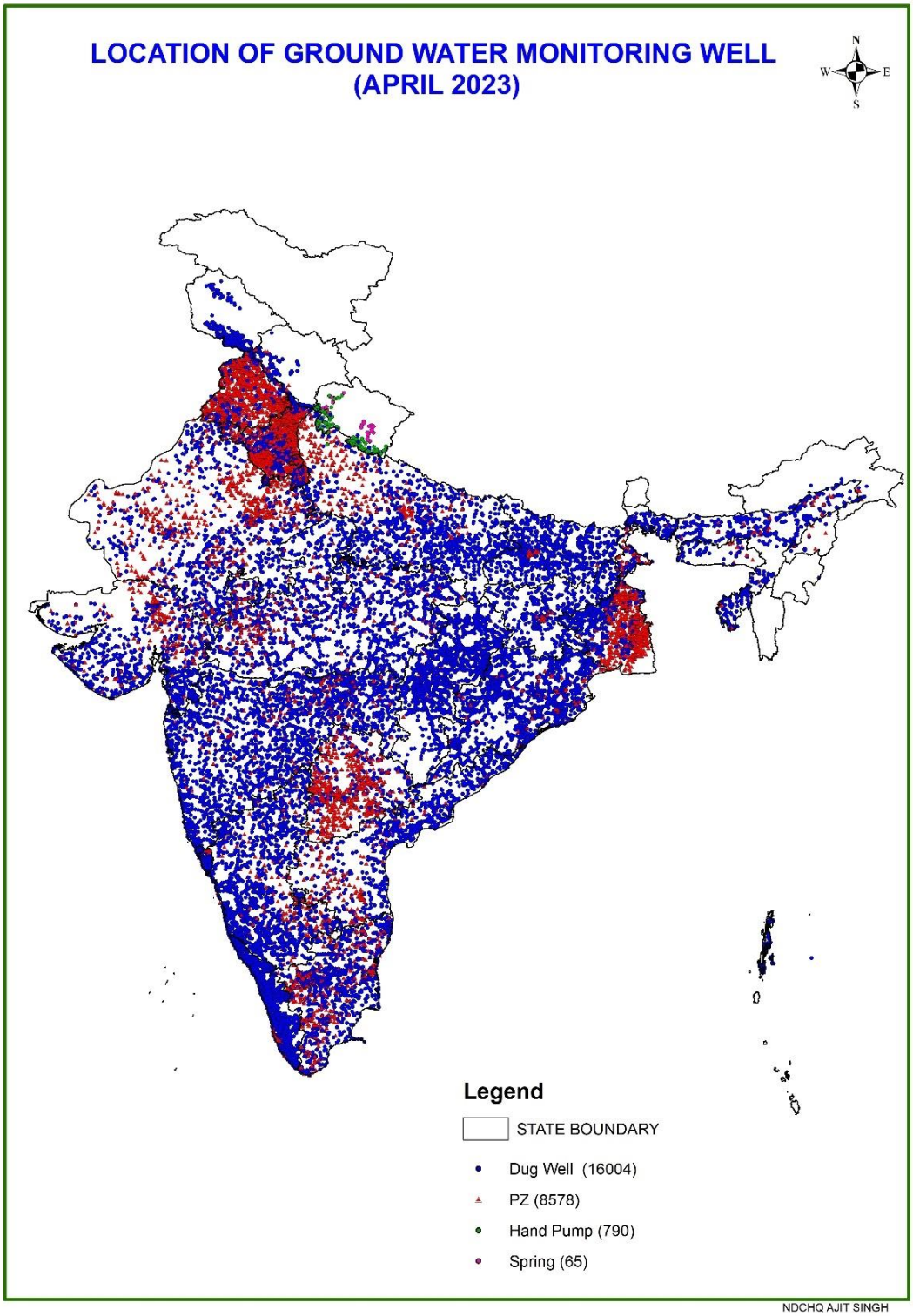
Based on the stage of extraction, the assessment units are categorized as Safe (<= 70%); Semi Critical (>70 % and <=90 %); Critical (>90% and <=100%) and Over-Exploited (>100 %).

Map 5: Principal Aquifer System of India



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

Map 6: Map of Ground Water Monitoring Stations in India



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

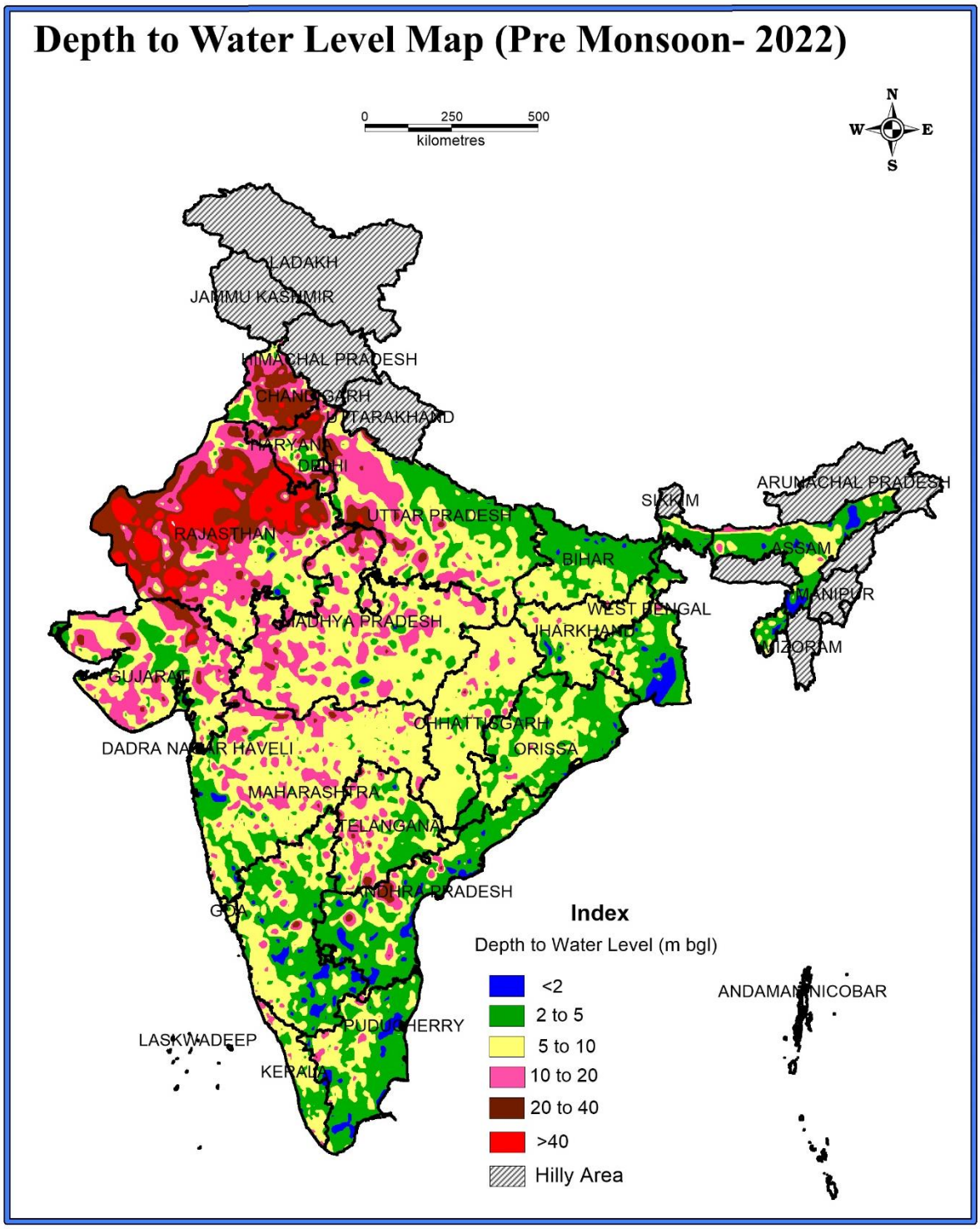
Table 2.18: State/UT-wise Ground Water Monitoring Wells in India

Sl. No.	Name of the States/UTs	Number of GW Monitoring Wells (as per Ground Water Reassessment, 2023)
1	2	3
States		
1	Andhra Pradesh	1334
2	Arunachal Pradesh	31
3	Assam	435
4	Bihar	890
5	Chhattisgarh	1287
6	Delhi	129
7	Goa	128
8	Gujarat	1270
9	Haryana	1297
10	Himachal Pradesh	194
11	Jammu & Kashmir	379
12	Jharkhand	515
13	Karnataka	2146
14	Kerala	1610
15	Madhya Pradesh	1612
16	Maharashtra	1931
17	Manipur	2
18	Meghalaya	74
19	Mizoram	3
20	Nagaland	13
21	Odisha	1718
22	Punjab	1170
23	Rajasthan	1351
24	Sikkim	4
25	Tamil Nadu	1381
26	Telangana	1207
27	Tripura	118
28	Uttar Pradesh	1194
29	Uttarakhand	225
30	West Bengal	1597
Union Territories		
1	Andaman & Nicobar Islands	112
2	Chandigarh	23
3	Dadra & Nagar Haveli	17
4	Daman & Diu	24
5	Puducherry	16
Total Ground Water Monitoring Wells		**25437**

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- 2022



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

Table 2.19: State-wise Ground Water Resources in India, 2023

(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	8.97	9.94	0.85	8.08	27.83	1.39	26.45	6.44	0.14	0.90	7.48	1.25	19.09	28.3
2	Arunachal Pradesh	2.11	0.66	1.06	0.81	4.65	0.49	4.16	0.01	0.00	0.01	0.02	0.01	4.15	0.42
3	Assam	19.29	0.81	6.53	0.63	27.26	6.32	20.93	2.06	0.01	0.55	2.63	0.58	18.27	12.54
4	Bihar	20.00	7.72	1.14	5.11	33.96	3.24	30.72	10.13	0.37	3.26	13.75	3.48	17.02	44.76
5	Chhattisgarh	8.39	2.24	0.23	2.49	13.34	1.16	12.18	4.87	0.13	0.75	5.75	0.83	6.51	47.17
6	Goa	0.36	0.01	0.00	0.03	0.40	0.08	0.32	0.03	0.01	0.04	0.07	0.04	0.25	21.37
7	Gujarat	19.49	2.75	0.00	5.12	27.35	1.95	25.41	12.13	0.17	0.84	13.13	0.80	12.86	51.68
8	Haryana	3.18	2.87	0.63	2.87	9.55	0.86	8.69	10.55	0.62	0.62	11.80	0.64	1.00	135.74
9	Himachal Pradesh	0.62	0.18	0.13	0.19	1.11	0.10	1.01	0.18	0.05	0.12	0.35	0.12	0.66	34.95
10	Jharkhand	4.96	0.46	0.46	0.37	6.25	0.52	5.73	0.94	0.21	0.65	1.80	0.65	3.95	31.38
11	Karnataka	9.22	4.95	1.12	3.64	18.93	1.85	17.08	10.09	0.13	1.10	11.32	1.18	7.29	66.26
12	Kerala	4.09	0.14	0.44	0.85	5.53	0.52	5.01	1.12	0.01	1.59	2.73	2.19	2.02	54.55
13	Madhya Pradesh	26.94	1.62	0.13	6.78	35.47	2.62	32.85	17.40	0.17	1.72	19.30	1.88	14.45	58.75

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Table 2.19: State-wise Ground Water Resources in India, 2023

(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	Maharashtra	20.74	2.62	0.64	8.76	32.76	1.82	30.95	15.28	0.03	1.36	16.66	1.42	14.81	53.83
15	Manipur	0.40	0.00	0.11	0.006	0.52	0.05	0.47	0.02	0.00	0.02	0.04	0.02	0.42	7.99
16	Meghalaya	1.32	0.05	0.42	0.04	1.83	0.32	1.51	0.02	0.00	0.04	0.07	0.05	1.43	4.58
17	Mizoram	0.19	0.00	0.03	0.00	0.22	0.02	0.20	0.00	0.00	0.01	0.01	0.01	0.19	3.70
18	Nagaland	0.40	0.12	0.08	0.00	0.60	0.06	0.54	0.00	0.00	0.02	0.02	0.02	0.52	3.76
19	Odisha	10.19	2.89	1.51	2.76	17.35	1.41	15.94	5.96	0.18	1.25	7.39	1.37	8.49	46.33
20	Punjab	4.72	9.07	0.72	4.33	18.84	1.87	16.98	26.39	0.24	1.18	27.80	1.19	1.82	163.76
21	Rajasthan	9.01	0.64	0.19	2.60	12.45	1.20	11.25	14.30	0.13	2.31	16.74	2.31	0.90	148.77
22	Sikkim	0.17	0.00	0.07	0.00	0.24	0.02	0.22	0.01	0.00	0.00	0.01	0.00	0.21	5.54
23	Tamil Nadu	7.26	10.36	1.30	2.66	21.59	2.10	19.51	13.48	0.15	0.79	14.42	1.47	6.86	73.91
24	Telangana	7.15	7.43	1.00	7.55	23.14	2.22	20.92	7.24	0.35	0.49	8.09	0.70	12.83	38.65
25	Tripura	0.81	0.16	0.32	0.07	1.36	0.26	1.09	0.03	0.00	0.08	0.11	0.09	0.98	9.92
26	Uttar Pradesh	35.72	14.01	0.78	21.32	71.83	6.26	65.57	40.92	0.44	5.04	46.40	5.42	20.04	70.76
27	Uttarakhand	1.31	0.29	0.10	0.32	2.02	0.17	1.85	0.67	0.12	0.17	0.95	0.17	0.89	51.69
28	West Bengal	16.91	1.71	3.54	4.13	26.29	2.39	23.90	8.99	0.15	1.57	10.71	1.77	13.07	44.81

Contd…

Table 2.19: State-wise Ground Water Resources in India, 2023

(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	Andaman & 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	1.37
30	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	75.41
31	Dadra & Nagar Haveli and Daman & Diu	0.09	0.01	0.00	0.02	0.12	0.01	0.12	0.01	0.14	0.01	0.16	0.03	0.01	142.91
32	Delhi	0.08	0.09	0.04	0.17	0.38	0.04	0.34	0.08	0.00	0.26	0.34	0.28	0.03	99.13
33	Jammu & Kashmir	1.17	1.94	1.18	0.64	4.94	0.47	4.46	0.32	0.05	0.71	1.08	0.73	3.36	24.20
34	Ladakh	0.01	0.05	0.02	0.00	0.09	0.01	0.08	0.00	0.00	0.03	0.03	0.03	0.05	37.05
35	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	61.72
36	Puducherry	0.05	0.09	0.01	0.04	0.20	0.02	0.18	0.07	0.01	0.05	0.13	0.05	0.05	70.27
Grand Total		**245.63**	**85.89**	**25.12**	**92.42**	**449.08**	**41.89**	**407.21**	**209.74**	**4.01**	**27.57**	**241.33**	**30.82**	**195.03**	**59.26**

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

Note 1: For National compilation, Evapotranspiration loss of Arunanchal Pradesh, Assam, Meghalaya, Tripura and Lakshadweep has been added in Total Natural Discharges.
Note 2: Minor discrepancies in numbers may arise due to rounding at various levels.
Note 3: Totals may not tally due to rounding off.

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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, 53 irrigation/ERM projects have been reported as completed as on March, 2023. Total Irrigation Potential targeted under 99 Priority Project is 76.03 Lakh Ha out of which 41.45 Lakh Ha was created up to March, 2016. A cumulative Irrigation Potential of 66.59 Lakh Ha out of 76.03 Lakh Ha (87.6%) has been created till March, 2023. Further, in December, 2021, implementation of PMKSY for the period of 2021-22 to 2025-26

has been approved by the Government of India with an outlay of Rs. 93,068.0 Cr including Rs. 37,454 Cr Central Assistance (CA) 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, 06 newly MMI/ERM projects, one each from Rajasthan, Himachal Pradesh, Maharashtra, Assam, Manipur and Tamil Nadu have been included in PMKSY-AIBP. During 2016-17 to 2022-23, Rs.14239.23 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)

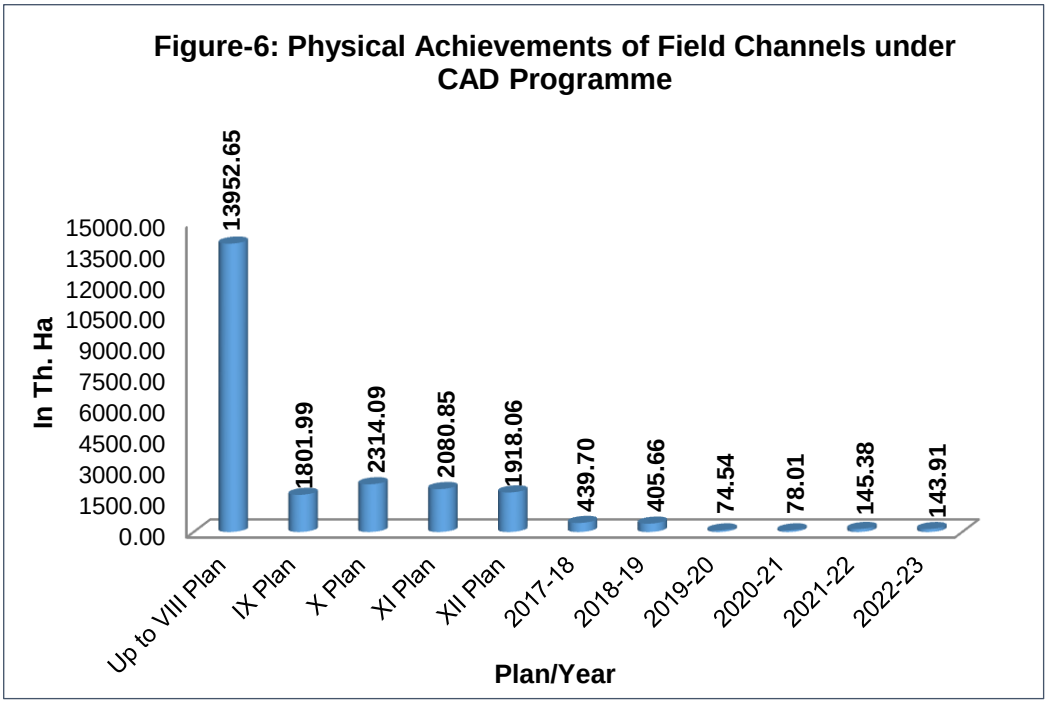
i. Initially, 60 major and medium irrigation projects were taken up under the CAD Programme, covering a Culturable Command Area (CCA) of about 15.00 Mha. At the end of FY 2015-16, there were 158 ongoing projects spread across the 29 States of the country with CCA of 16.3 Mha.

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 below:

Sl. No.	Plan/Year	Achievements (in Th. Ha)
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	74.54
9	2020-21	78.01
10	2021-22	145.38
11	2022-23	143.91
Cumulative Achievement up to 31.03.2023		**23354.84**

Source: SPR-II Wing, D/o Water Resources, RD&GR, 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, 7359 SMI schemes have been reportedly included under the programme (till 31.03.2023). Out of this, 4428 schemes have been reported to be completed. So far, Central Assistance amounting to Rs. 9009.16 Cr has been released for completion of these schemes till 31.3.2023. Out of this, an amount of Rs. 312.545 Cr was released during 2022-23. The details of SMI projects included for funding under the scheme SMI during 2022-23 are given below:

Sl. No.	State	No. of SMI Schemes	Estimated Cost (Rs. in Cr)
1	Nagaland	2	13.98
2	Assam	9*	302.07
3	Karnataka	138*	443.46
Total		**149**	**759.51**

Source: Economics Directorate, CWC, M/o Jal Shakti

Note: '*': 7359 SMI schemes included since XII Plan, excludes 09 Nos. of SMI schemes of Assam & 138 Nos. SMI schemes of Karnataka State.

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; 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 2022-23, an amount of Rs. 58.544 Cr has been released for RRR of Water Bodies under PMKSY-HKKP. Also, 35.212 MCM storage has been restored and 198 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 is Rs. 978.00 Cr and Central Assistance is Rs.827.15 Cr out of which 764.89 Cr has already been released as on 31st March, 2023 by the Ministry of Jal Shakti. The cumulative financial progress status of PMKSY-HKKP-GW as on 31st March, 2023, is given below:

Sl. No.	State	Projects	Project Cost (Rs.in Cr)	CA Released (As on 31st March, 2023)	CA Released in 2022-23
1	2	3	4	5	6
1	Assam	Assam Phase-I	246.69	439.65	3.69
2		Assam Phase-II	292.96		0.00
3	Arunachal Pradesh	Arunachal Pradesh Phase-I	45.30	79.90	0.00
4		Arunachal Pradesh Phase-II	44.95		0.00
5	Gujarat	Gujarat	119.19	71.44	36.94
6	Nagaland	Nagaland	18.15	16.25	0.65
7	Manipur	Manipur	61.68	54.40	0.00
8	Mizoram	Mizoram	16.04	13.86	5.20
9	Tamil Nadu	Tamil Nadu	9.13	5.36	0.08
10	Tripura	Tripura Phase-I	13.31		0.26

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Sl. No.	State	Projects	Project Cost (Rs.in Cr)	CA Released (As on 31st March, 2023)	CA Released in 2022-23
1	2	3	4	5	6
11		Tripura Phase-II	48.34	43.63	7.74
12	Uttarakhand	Uttarakhand	15.89	13.72	0.00
13	Uttar Pradesh	Uttar Pradesh	46.37	26.69	10.00
Total			**978.00**	**764.89**	**64.55**

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

v. As on March, 2023; 29695 wells have been constructed, 77964 Ha command area have been created and 67285 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, 2023, 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/ 4916	19664/ 19532	17216/ 17200
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/ 851
7	Tripura Phase-II	890/ 885	2670/ 735	1639/ 1166
8	Manipur	550/ 550	2057/ 2057	1445/ 1445
9	Mizoram	209/ 133	553/ 333.40	411/ 296
10	Uttar Pradesh	14752/ 14752	36365/ 27944	15252/ 15252
11	Uttarakhand	206/ 206	1030/ 1030	1085/ 1085
12	Gujarat	1826/ 1826	1866/ 1866	1908/ 1908
13	Tamil Nadu	166/ 163	610/ 603	1233/ 1192
Total		**29779/ 29695**	**88679/ 77964**	**67930/ 67285**

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

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) (2016-2023)	Cumulative CLA/Grant Released under AIBP as on 31.03.2023 (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	2	41.98	556.75
3	Bihar	9	5	2	0	110.24	872.14
4	Chhattisgarh	11	9	3	2	46.05	564.50
5	Goa	2	1	1	1	0.00	273.17
6	Gujarat	15	14	1	0	4501.39	13383.09
7	Haryana	3	2	0	-	-	90.54
8	Himachal Pradesh	4	1	1	-	2.25	381.15
9	Jharkhand	10	3	1	0	756.73	2004.32
10	Karnataka	19	8	5	3	1190.05	7177.41
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)	17 projects (i/c phases of BDP, ISP & OSP)	756.16	6163.94
13	Maharashtra	64	46	27	10	2304.78	12668.68
14	Manipur	3	1	3	1	264.98	1632.47
15	Meghalaya	1	0	0	-	-	4.00
16	Odisha	18	12	8	5	1208.86	5898.62
17	Punjab	7	5	2	2	52.42	724.46
18	Rajasthan	10	9	3	2	499.99	2674.05
19	Tamil Nadu	1	1	1	-	34.74	54.74
20	Telangana	17	9	11	3	981.49	5057.21
21	Tripura	3	0	0	-	-	126.29
22	UT of Jammu & Kashmir	18	13	3	3	39.71	520.49
23	UT of Ladakh	1		1	0	2.98	34.63
24	Uttar Pradesh	18	11	4	1	1421.82	6011.44
25	Uttrakhand	2	1	0	-	-	609.75
26	West Bengal	7	3	0	-	-	385.00
Total		**297***	**187****	**105 (112 including phases)**	**53**	**14239.23**	**69470.35**

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

Note '*' 5 projects have been deferred; '**'including 53 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) (2016-2023)
			2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	1377.76	7.40	15.24	0.00	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	41.90	41.90
3	Bihar	761.90	0.00	46.32	37.82	11.98	14.12	0.00	0.00	110.24
4	Chhattisgarh	518.44	13.29	17.26	0.00	4.09	6.45	3.12	1.85	46.06
5	Goa	273.17	0.00	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	61.15	4501.40
7	Haryana	90.54	0.00	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	0.00	2.25
9	Jharkhand	1247.59	145.75	305.10	305.88	0.00	0.00	0.00	0.00	756.73
10	Karnataka	5987.36	135.47	459.52	197.00	163.42	231.22	0.00	3.42	1190.05
11	Kerala	201.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Madhya Pradesh	5407.76	300.15	181.27	81.01	26.45	19.96	59.47	87.86	756.19
13	Maharashtra	10363.89	379.88	363.05	527.54	291.68	301.85	285.55	155.28	2304.79
14	Manipur	1367.48	126.99	25.42	21.93	30.50	23.51	11.75	24.88	264.98
15	Meghalaya	4.00	0.00	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	0.00	1208.87
17	Punjab	672.03	52.42	0.00	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	0.00	499.99
19	Tamil Nadu	20.00	0.00	0.00	0.00	0.00	0.00	9.04	25.70	34.74
20	Telangana	4075.72	545.44	13.24	1.99	214.05	162.82	43.95	0.00	981.49
21	Tripura	126.29	0.00	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	0.00	39.71
23	UT of Ladakh	31.66	0.00	1.36	0.00	0.81	0.81	0.00	0.00	2.98
24	Uttar Pradesh	4589.63	135.63	65.60	397.16	407.68	391.84	0.00	23.91	1421.81
25	Uttarakhand	609.75	0.00	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	0.00
Total		**55231.04**	**3307.93**	**3593.63**	**2849.08**	**1738.77**	**1510.04**	**813.84**	**426.03**	**14239.23**

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 2) 26.5 MW 3)1147.14 MCM (Gross)	18494.57 (PL 2012-13)	3881.2825	December, 2024
2	Saryu Nahar Pariyojana	Uttar Pradesh (Diversion Scheme among Rivers Ghaghara, Saryu, Rapti & Bansagar/ Ganga)	1) 14.04 (NP Component:4.73) 2) – 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 2) 960 MW 3) 5511 MCM (Gross)	47725.74 (P.L. 2017-18)	15146.270	March,2026
4	Shahpurkandi Dam Project	Punjab (Ravi)	1) 0.37 Lakh 2) 206 MW 3) 120.71 MCM (Gross)	3394.49 (PL-Oct, 2022)	390.8058	June, 2024
5	Teesta Barrage Project	West Bengal (Teesta)	1) 9.23 Lakh (NP component: 5.27 Lakh) 2) 1000 MW 3) Barrage	2988.61	178.20	Project is at standstill since 2014-15 due to land acquisition issues.
6	Renukaji Dam Project	Himachal Pradesh (Giri/Yamuna)	1) Drinking water 2) 40 MW 3) 498 MCM Drinking (Live)	6946.99 (PL Oct, 2018)	1909.9569	30th April, 2029
7	Lakhwar Multipurpose Project	Uttarakhand (Yamuna)	1) 0.3378 Lakh 2) 300 MW 3) 587.84 MCM (Gross)/39.415 MCM (Drinking)/39.415 MCM (Industrial)	5747.17 (PL July, 2018)	204.14	Oct, 2028
8	Ken-Betwa Link Project	Madhya Pradesh & Uttar Pradesh (Ken & Betwa/ Yamuna Basin)	1) 9.08 Lakh (CCA) 2) 130 MW 3) 3495 MCM (Live)	Rs 44605 Cr (PL 2020-21)	6659.01	March, 2030
9	Ujh Multipurpose Project	Jammu & Kashmir (Ujh/Ravi)	1) 0.91 Lakh 2) 89.5 MW 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.

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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) 2) 55 MW 3) 525.64 MCM (Gross)	Unit-I= 1073.05 Unit-II= 290.12 E&M Cost = 91.78 (PL June 2017)	----	----
11	Noa Dihing Dam Project	Arunachal Pradesh (Noa-Dihing)	1) 0.036 Lakh (CCA) 2) 72 MW 3) 322.00 MCM (Gross)	1291.93 (PL May, 2017)	----	-----
12	Bursar HE Project	Jammu & Kashmir (Marusudar/ Chenab/Indus)	1) 1.74 Lakh (Indirect) 2) 800 MW 3) 616.74 MCM (Gross)	16839.90 (PL Oct 2016)	----	----
13	Kishau Multipurpose Project	Himachal Pradesh & Uttarakhand (Tons/Yamuna)	1) 0.97 Lakh Ha 2) 660 MW 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 2) 300 MW 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 2) 9750 MW 3) 9.2 BCM (Live) 4) Flood moderation	----	----	----

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

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 2016-23	%	Total CA Released 2016-23	%	Total CCA 2016-23	%
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	178.62	339.72	687.86	3.66	0.53	69.18	20.36	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	75.39	52.94	35.82	70.71	19.11	62.65
4	Chhattisgarh	42.63	79.57	159.76	16.58	10.38	21.71	27.28	7.14	16.76
5	Goa	8.67	18.77	137.92	45.83	33.23	3.84	20.46	6.70	77.27
6	Gujarat	1363.86	2510.88	5021.76	5531.36	110.15	1719.15	68.47	1022.02	74.94
7	Jammu & Kashmir	2.46	5.24	11.64	7.43	63.86	3.57	68.12	1.72	70.04
8	Jharkhand	66.65	133.32	747.53	0.00	0.00	0.00	0.00	0.00	0.00
9	Karnataka	83.48	163.85	989.24	168.86	17.07	78.25	47.76	41.08	49.21
10	Kerala	18.48	48.72	107.30	4.77	4.45	2.69	5.52	1.50	8.10
11	Madhya Pradesh	595.52	1259.04	2536.99	794.71	31.32	316.09	25.11	276.63	46.45
12	Maharashtra	500.71	967.51	2078.20	563.05	27.09	209.65	21.67	174.79	34.91
13	Manipur	22.04	60.42	120.65	37.25	30.87	2.09	3.45	15.15	68.76
14	Odisha	236.40	420.40	1266.06	1247.61	98.54	131.96	31.39	91.86	38.86
15	Punjab	142.66	228.87	475.48	69.70	14.66	27.08	0.00	26.76	0.00
16	Rajasthan	363.98	224.82	439.01	312.82	71.26	133.43	59.35	90.16	24.77
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	6.25	0.00	156.00	17.05	18.90	3.60
Total		**4756.66**	**8225.56**	**18466.31**	**8936.64**	**48.39**	**2954.41**	**35.92**	**1830.53**	**38.48**

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 Water Resources, 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 99.80 km and Relining of Rajasthan Feeder for 96.62 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	564.47	203.651	June, 2024
2	Relining of Rajasthan Feeder from RD 179000 to 496000	1210.417	726.25	1963	1184.51	559.524	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	Expenditure Incurred in 2022-23
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Tembhu LIS Dist. Satara	Satara, Sangli, Solapur	3108.54	2993.50	2993.50	1088.62	272.16	260.10	374.34	308.25	121.81	24.12
2	Urmodi Dist. Satara	Satara	1566.39	895.81	580.79	414.93	103.73	42.50	43.28	26.19	25.93	75.25
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	642.57
4	Shelgaon Barrage Medium Project, Dist.Jalgaon	Jalgaon	620.58	879.49	879.49	535.45	133.86	55.94	188.59	66.19	168.83	0.00
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	21.32
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	0.55
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	1153.55
8	Warkhed Londhe Dist. Jalgaon	Jalgaon	465.86	465.86	465.86	363.62	90.91	77.38	104.13	80.26	14.49	23.20
Total MMI			**16838.92**	**15883.93**	**15568.91**	**9206.87**	**2301.72**	**1034.02**	**1545.98**	**1515.91**	**1115.69**	**1940.56**
Total SMI (83 Projects)			**8364.84**	**8155.36**	**7407.37**	**3965.12**	**991.28**	**633.10**	**479.14**	**292.03**	**180.13**	**220.59**
Grand Total			**25203.76**	**24039.29**	**22976.28**	**13171.99**	**3292.99**	**1667.12**	**2025.12**	**1807.94**	**1295.82**	**2161.15**

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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	CA Released during 2022-23	Total CA Released so far
1	2	3	14	15	16	17	18	19
1	Tembhu LIS Dist. Satara	Satara, Sangli, Solapur	25.00	69.79	77.56	108.01	10.77	291.13
2	Urmodi Dist. Satara	Satara	13.27	10.63	0.00	14.35	0.00	38.25
3	Sulwade Jamphal Kanoli L.I. Scheme Dist. Dhule	Dhule	0.23	0.00	95.97	108.55	103.47	308.22
4	Shelgaon Barrage Medium Project, Dist. Jalgaon	Jalgaon	15.22	13.99	47.15	43.59	15.32	135.27
5	Ghungshi Barrage LIS Akola	Akola (V)	3.27	2.55	3.84	10.43	2.71	22.80
6	Purna Barrage No.2 (Nerdhamana) Dist. Akola	Akola (V)	0.00	0.00	12.43	0.74	1.35	14.52
7	Jigaon Dist. Buldhana	Buldhana (V), Akola (V)	262.03	17.01	39.53	336.42	33.66	688.65
8	Warkhed Londhe Dist. Jalgaon	Jalgaon	10.41	19.35	26.03	23.68	2.78	82.25
Total MMI			**329.43**	**133.31**	**302.52**	**645.77**	**170.04**	**1581.06**
Total SMI			**170.58**	**166.69**	**97.49**	**79.24**	**42.97**	**556.96**
Grand Total			**500.00**	**300.00**	**400.00**	**725.01**	**213.01**	**2138.01**

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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	IP Created during 2022-23
1	2	3	20	21	22	23	24	25	26	27	28
1	Tembhu LIS Dist. Satara	Satara, Sangli, Solapur	111856.00	10258.00	5279.00	96319.00	37698.00	34000.00	11000.00	11374.00	0.00
2	Urmodi Dist. Satara	Satara	32000.00	6497.00	1131.00	24372.00	1323.00	4509.00	820.00	2120.00	715.00
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	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	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	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	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	0.00
8	Varkhede Londhe Dist. Jalgaon	Jalgaon	7919.00	0.00	0.00	7919.00	0.00	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**	**715.00**
Total SMI			**76334.00**	**8766.00**	**1571.00**	**65997.00**	**4712.00**	**7101.00**	**3128.00**	**10420.00**	**2585.00**
Grand Total			**406849.00**	**25521.00**	**7981.00**	**373347.00**	**43733.00**	**45610.00**	**14948.00**	**23914.00**	**3300.00**

Source: Monitoring (Central) Directorate, PMO, Central Water Commission, M/o Jal Shakti
Note: 'MMI': Major & Medium Irrigation; 'SMI': Surface Minor Irrigation; 'IP': Irrigation Potential; 'CA': Central Assistance

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.

iii. Details of the Preliminary Project Report (PPR) for which In-Principle consent were provided to D/o WR, RD&GR for the year 2022-23:

Sl. No.	State	Name of Project	Funding Agency	Cost in Cr
1	West Bengal	West Bengal Accelerated Development of Minor Irrigation Project Phase-II	World Bank	1500
2	Kerala	Kerala Sustainable Coastal Protection and Climate Resilience Planning Project	ADB	3500
3	Kerala	Additional Financing for Resilient Kerala Program - Coastal Protection Project (Phase II)	World Bank	1590
4	Uttarakhand	Song dam Drinking Water Project	AFD	2021.57

Source: External Assistance Directorate, CWC, M/o Jal Shakti

iv. Details of the Detailed Project Report (DPR) accepted by the Advisory Committee of D/o WR, RD&GR in its 150th meeting held on 19.09.2022.

Sl. No.	State	Name of Project	Funding Agency	Cost in Cr
1	Andhra Pradesh	Improvement to Swarnamukhi Anicut System under Andhra Pradesh Irrigation and Livelihood Improvement Phase 2 (APILIP-II)	JICA	53.635

Source: External Assistance Directorate, CWC, M/o Jal Shakti

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 & 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 for the next five years. 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 the Cabinet approved Namami Gange II for Rs. 22,500 Cr for the period 2021-2026. The focus shall be on sewerage infrastructure creation in Ganga tributaries, scaling up of public private partnership efforts, circular water economy model and fecal sludge and septage management.

Table 3.6 (a): Project Summary under Namami Gange Programme for the year 2022-23

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	41	223.14	196.23	1581.59	36	164.50	174.91
		Uttar Pradesh	63	2185.19	1885.64	13142.90	34	922.76	1797.93
		Bihar	36	731.60	1790.09	6082.71	13	241.50	1259.58
		Jharkhand	5	262.50	151.36	1310.30	2	15.50	87.90
		West Bengal	27	885.22	975.38	4742.02	11	379.07	848.77
		Haryana	2	145.00	41.00	218.00	2	145.00	51.62
		Delhi	9	1268.00	37.32	1951.00	6	704.00	36.00
		Himachal Pradesh	1	1.72	-	12.00	1	1.72	-
		Rajasthan	1	36.00	146.00	258.00	0	36.00	122.55
		Madhya Pradesh	1	195.00	15.27	511.15	0	0.00	0.00
		Modular STP Decentralized	1	-	-	410.00	-	-	-
		Total (a)	**187**	**5933.37**	**5238.29**	**30220.00**	**105**	**2610.05**	**4379.26**

Source: Annual Report 2022-23 of National Mission for Clean Ganga (NMCG), M/o Jal Shakti

Table 3.6 (b): Project Summary under Namami Gange Programme for the year 2022-23 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	103	-	-	1675.58	77	-	-
2	Afforestation and Biodiversity Conservation	47	-	-	714.21	33	-	-
3	Ghats Cleaning & River Surface Cleaning	6	-	-	93.37	4	-	-
4	Industrial Pollution Abatement	18	-	-	1467.23	2	-	-
5	Rural Sanitation	8	-	-	148.07	2	-	-
6	Other Projects	59	-	-	2194.80	21	-	-
Total (b)		**241**	**-**	**-**	**6293.26**	**139**	**-**	**-**
Grand Total (a+b)		**428**	**5933.37**	**5238.29**	**36512.93**	**244**	**2610.05**	**4379.26**

Source: Annual Report 2022-23 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, six Censuses have been conducted with reference years 1986-87, 1993-94, 2000-01, 2006-07, 2013-14 & 2017-18 respectively. The All India and State wise reports of 6th MI Census with reference year 2017-18 were released in August, 2023 and is available on the website of the D/o Water Resources, RD & GR, M/o Jal Shakti. 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. Further, in the year 2022-23, it was Rs. 2467.38 Cr, shows an increasing trend again. In the year 2022-23, it was increased about 1063.05 Cr from the expenditure during the year 2021-22.

v. While analyzing the State-wise expenditure on Minor irrigation for the year 2022-23, it was found that the maximum expenditure was in Odisha followed by Telangana, Haryana, Tamil Nadu, Chhattisgarh, Bihar, Rajasthan, Himachal Pradesh, West Bengal, Uttar Pradesh and Uttarakhand. The expenditure in respect of these States was about 90% of the total expenditure during 2022-23. During 2022-23, the expenditure on minor irrigation was highly increased in Odisha, Telangana, Haryana, Tamil Nadu, Chhattisgarh, Himachal Pradesh and West Bengal in comparison to their expenditure in previous years while in Maharashtra, Karnataka and Uttar Pradesh the expenditure on minor irrigation was highly decreased 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)	(2022-23)
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	164.18	34.94	37.02	35.90	27.01	49.83	2.29
2	Arunachal Pradesh	0.00	0.00	0.00	0.00	0.00	0.00	2.36
3	Assam	1.14	0.00	0.00	0.00	0.00	0.00	36.79
4	Bihar	168.44	80.84	0.09	1.22	87.14	162.78	189.80
5	Chhattisgarh	47.96	7.59	2.59	0.69	0.57	6.97	207.61
6	Goa	0.09	0.00	0.00	0.00	0.00	0.00	5.49
7	Gujarat	628.24	90.69	91.59	51.60	19.29	36.07	7.95
8	Haryana	273.38	71.43	19.71	0.01	14.28	47.42	284.93
9	Himachal Pradesh	10.04	0.00	10.81	7.50	8.65	2.20	103.80
10	Jammu & Kashmir	0.02	0.00	0.00	0.00	0.00	0.00	2.40
11	Jharkhand	4.95	0.00	0.02	0.01	0.00	0.03	0.00
12	Karnataka	463.46	339.03	256.34	242.57	145.43	199.42	46.25
13	Kerala	408.12	74.18	45.23	141.83	92.00	45.14	34.66
14	Madhya Pradesh	139.37	6.08	18.54	0.06	10.70	0.55	0.00
15	Maharashtra	1089.26	486.33	302.27	242.78	165.44	459.33	6.53
16	Manipur	0.00	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	3.95
18	Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.51
19	Nagaland	0.00	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	459.54
21	Punjab	254.34	22.45	21.78	9.79	0.05	6.19	43.53
22	Rajasthan	274.79	74.54	9.67	10.71	12.75	182.07	170.88
23	Sikkim	0.00	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	221.50
25	Telangana	0.00	21.66	11.49	53.10	2.92	13.17	341.06
26	Tripura	0.00	0.00	0.00	0.00	0.00	0.00	48.07
27	Uttarakhand	0.03	0.00	0.01	0.00	0.00	1.60	52.41
28	Uttar Pradesh	266.30	14.32	28.08	1.03	0.26	183.58	95.73
29	West Bengal	6.80	0.04	0.03	0.00	0.00	0.10	95.76
Union Territories								
30	A & N Islands	0.00	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	0.00
32	Dadra & Nagar	0.00	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	0.00
34	Delhi	0.00	0.00	0.07	0.22	0.00	0.14	0.00
35	Puducherry	1.08	0.00	0.08	0.31	0.67	0.00	3.58
36	Lakshadweep	0.00	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**	**2467.38**

Source: NABARD

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**	**-**	**5340.9**	**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**	**-**	**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	3565.2	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

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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**	**104062.4**	**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**	**19516.80**	**23875.29**	**2100.22**
2012-13	XII Plan	9323.12	64693.31	1308.04	5016.87	6324.91	911.89
2013-14		10197.89	74891.20	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**	**-**	**7366.60**	**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)

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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 31.03.2023)

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	11	15
17	Sikkim	3	5	8
18	Tamil Nadu	4	11	15
19	Telangana	5	9	14
20	Tripura	2	0	2

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Table 4.1: State-wise Flood Forecasting Stations of CWC

(as on 31.03.2023)

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**	**134**	**333**

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 31.03.2023)

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	40	136
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	25	43
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**	**134**	**333**

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

Table 4.3: Flood Forecasting Performance from 2000 to 2023

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
24	2023	4567	4336	94.94	1772	1616	91.20	6339	5952	93.89
Average		**5204**	**5064**	**97.31**	**1574**	**1415**	**89.90**	**6778**	**6479**	**95.59**

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

Figure-7: Forecast Performance (from 2000 to 2023)

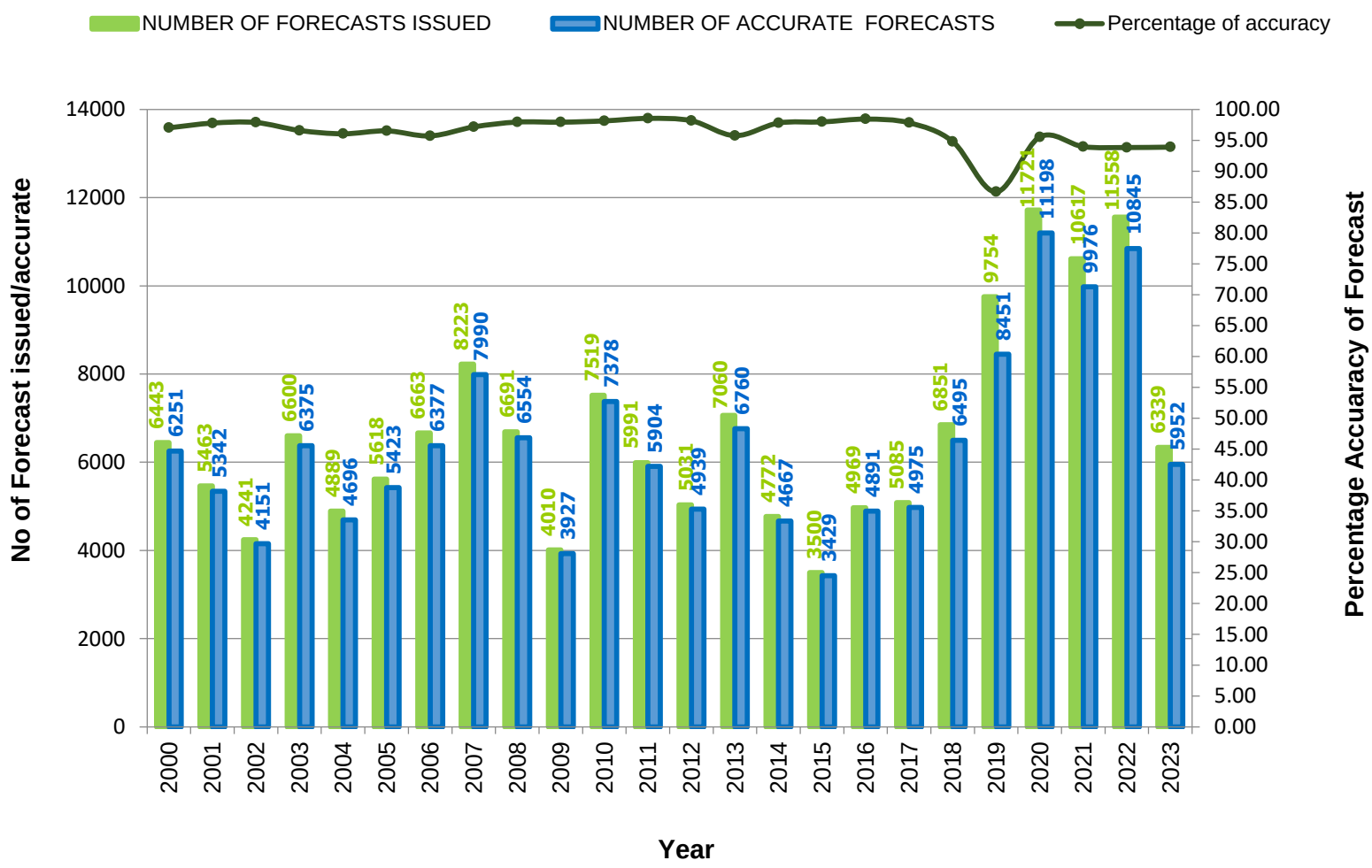

Table 4.4: Flood Damage during 2011 to 2022

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
12	2022	7.62	25.81	6.71	18224.22	376649	3212.63	574503	1673	5955.33	27392.17
Total		**92.56**	**365.10**	**69.03**	**114300.32**	**10475641**	**31227.77**	**1158756**	**20856**	**161198.55**	**306726.63**
Avg.		**7.71**	**30.43**	**5.75**	**9525.03**	**872970**	**2602.31**	**96563**	**1738**	**13433.21**	**25560.55**
Max.		**16.75**	**47.34**	**10.69**	**29229.71**	**3959191**	**9384.02**	**574503**	**2754**	**38937.84**	**58433.40**
(Year)		**2021**	**2017**	**2019**	**2021**	**2015**	**2017**	**2022**	**2019**	**2013**	**2021**

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

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 the erstwhile M/o Water Resources, RD&GR, was approved by the 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. 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 2022-23

Sl. No.	State	XI Plan (Schemes Approved)	XII Plan (Schemes Approved)	Total (XI+XII Plan)				FMBAP 2021-26 (till FY2022-23)	Total schemes approved since XI Plan till FY 2022-23	Total Central fund released since XI Plan till FY 2022-23
		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	1549.84
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
8	Himachal Pradesh	3	4	7	6	1	0	1	8	832.57

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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 2022-23

Sl. No.	State	XI Plan (Schemes Approved)	XII Plan (Schemes Approved)	Total (XI+XII Plan)				FMBAP 2021-26 (till FY2022-23)	Total schemes approved since XI Plan till FY 2022-23	Total Central fund released since XI Plan till FY 2022-23
		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
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	219.71
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**	**7012.79**

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 Union 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 FY 2022-23. 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: 2021-23	Total Fund Released since XI plan till FY 2022-23
1	2	3	4	5	6	7	8
1	FMP	3566.00	1307.07	4873.07	1574.68	565.04	7012.79
2	RMBA (Grant-in-Aid)	340.41	223.20	563.61	527.83	92.70	1184.14
Total		**3906.41**	**1530.27**	**5436.68**	**2102.51**	**657.74**	**8196.93**

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)

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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 (as per the latest availability of data)

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

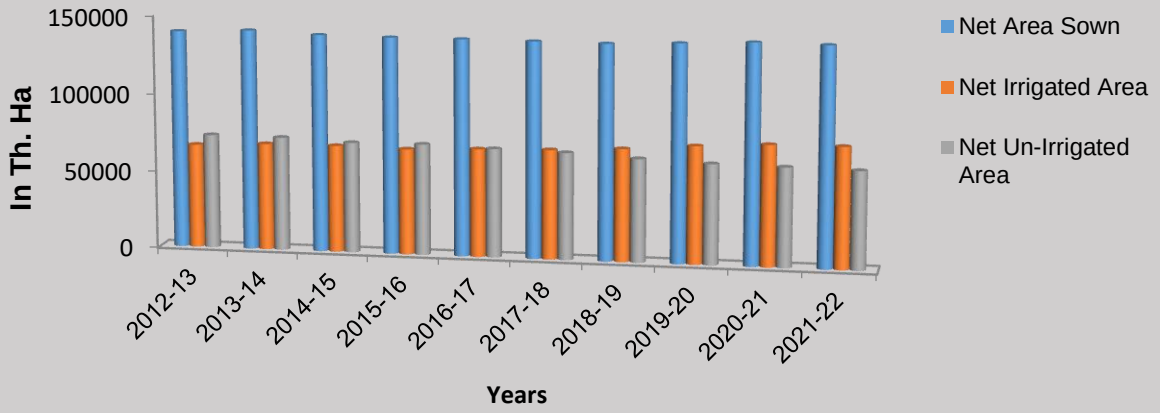


Table 5.2: Year-wise Gross Area Sown, Gross Irrigated Area and Gross Un-Irrigated Area

(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 (as per the latest availability of data)

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

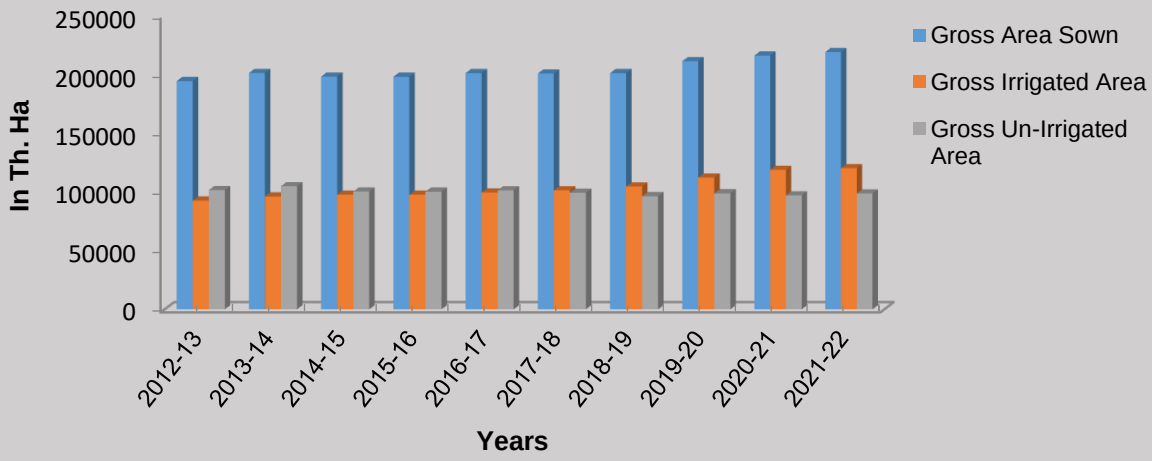


Table 5.3: Total Cultivable Land and Cropping Intensity

(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 (as per the latest availability of data)

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 (as per the latest availability of data)

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

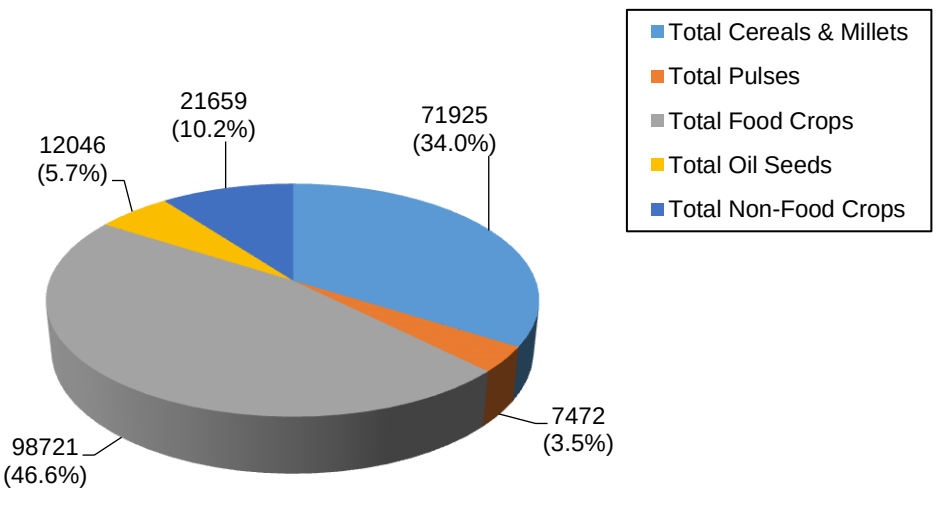
(Th. Ha)

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 (as per the latest availability of data)

i. 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. So far, six Censuses have been conducted with reference years 1986-87, 1993-94, 2000-01, 2006-07, 2013-14 & 2017-18 respectively. The All India and State wise reports of 6th MI Census with reference year 2017-18 were released in August, 2023 and is available on the website of the D/o Water Resources, RD & GR, M/o Jal Shakti.

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 (as per the latest availability of data)

Table 5.7: Area, Production and 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	1.30
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	130.17	315.62	2.43
19	2022-23	132.20	329.69	2.49

Source: Economics, Statistics & Evaluation Division, Department of Agriculture & Farmers Welfare, M/o Agriculture & Farmers Welfare

Figure-11: Area and Production of Food Grains (Last 5 years)

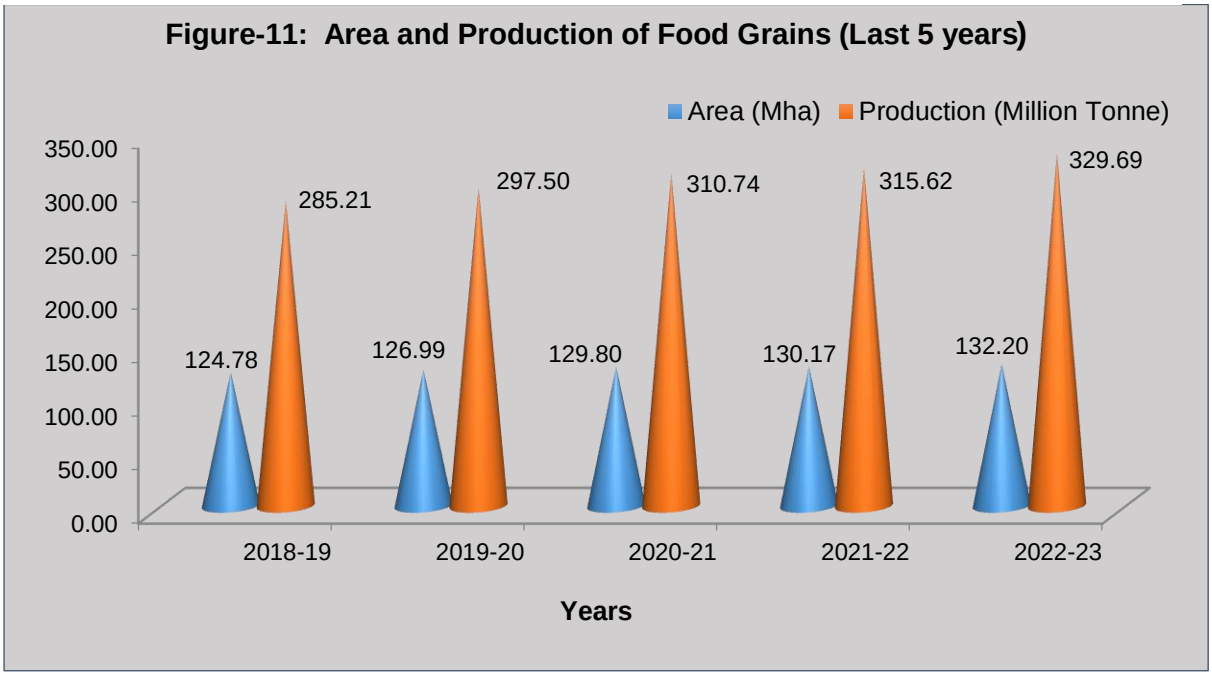


Table 5.8: State/UT-wise Water Rates for Flow and Lift Irrigation

(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

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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

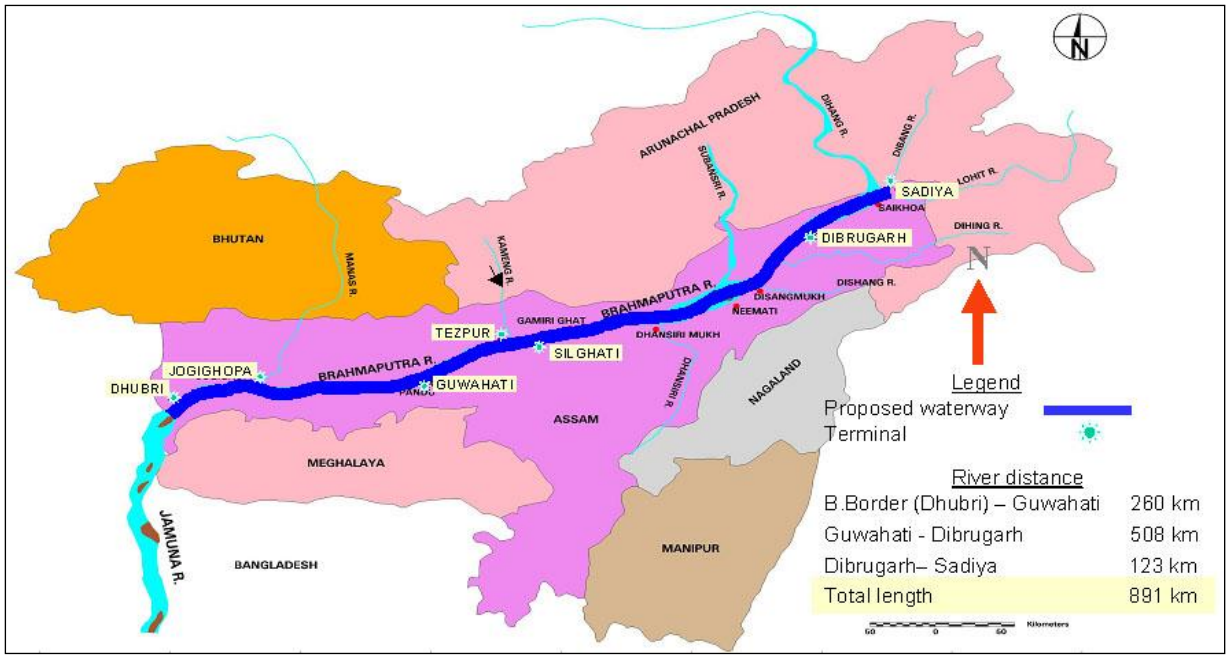
(v) East Coast Canal integrated with Brahmani River and Mahanadi Delta Rivers (588 km) as National Waterway-5 in 2008.

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 2022-23, 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.

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 at Bolghatty and Willingdon Island in Cochin Port limit sand 2 nos. of Ro-Ro vessels built by IWAI were deployed for Ro-Ro service between these two terminals. NW-3 is provided with 24 hours navigational aids in the 205 km route. Total tonnage of 32.28 Lakh Tonnes of cargo transported on NW-3 during the FY 2022-23. 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.

6.1.4 National Waterway-4

National Waterway-4 was 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 2,916 km by extending river Godavari up to Nasik and river Krishna up to Galagali.

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.

ii. 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)	Stretch II: Dhamra to Paradip	:	95 km
(iii)	Stretch III: Dhamra to Geonkhali	:	256 km
	Total	:	588 km

iii. 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:

Phase-I between Paradip/Dhamra and Pankapal : 212 km
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 the following link: https://shipmin.gov.in/sites/default/files/IWT%202022%2023%20APPROVED.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),
(x) Kali River (NW-52),
(xi) Ichamati River (NW-44),
(xii) Kopili River (NW-57),
(xiii) Dhansiri River (NW-31)

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 1261.51 Lakh tonnes in 2022-23 as against 1087.93 Lakhs tonnes in 2021-22, reflecting an increase of 15.96%. Goa, Maharashtra, Gujarat, Sundarbans & Icchamati accounted for cargo movement of 2.3%, 50.1%, 21.9%, 4.3% and 1.19% respectively of the total cargo volume in 2022-23. In terms of tonne km, there was a increase by 9.36% in 2022-23 over 2021-22 and cargo carried on Indian Waterways is 33.28 Tonne kms. Goa, Maharashtra, Gujarat, Sundarbans, Icchamati waterways though accounted 79.79 % of the total cargo movement on inland waterways across India, in terms of tonne km their share was 53.99% only.

Table 6.1: Cargo Movement on Major Waterways

Sl. No.	Details of Waterways	Cargo Moved (Lakh Tonnes)			Tonne kms (In Lakh)		
		2020-21	2021-22	2022-23	2020-21	2021-22	2022-23
1	National Waterways-1	92.06	109.28	131.70	23309.40	20082.07	18703.99
		(11.0)	(10.0)	(10.4)	(52.33)	(52.3)	(44.55)
2	National Waterways-2	3.07	4.28	6.30	44.90	74.38	106.67
		(0.4)	(0.4)	(0.5)	(0.1)	(0.2)	(0.25)
3	National Waterways-3	7.38	16.95	32.28	214.80	179.19	213.19
		(0.9)	(1.6)	(2.6)	(0.5)	(0.5)	(0.51)
4	National Waterways-4	68.32	112.34	84.18	189.90	316.47	295.22
		(8.2)	(10.3)	(6.7)	(0.4)	(0.8)	(0.70)
Sub Total NWs		**170.83**	**242.85**	**254.46**	**23759.00**	**20652.11**	**19319.08**
		(20.4)	(22.3)	(20.2)	(53.3)	(53.8)	(46.01)
5	Goa Waterways	84.61	45.78	29.29	4124.40	2155.39	1587.47
		(10.1)	(4.2)	(2.3)	(9.3)	(5.6)	(3.78)
6	Maharashtra Waterways	282.10	436.06	631.49	5697.00	1592.35	8177.97
		(33.7)	(40.1)	(50.1)	(12.8)	(4.1)	(19.48)
7	Gujarat Waterways	257.12	293.67	276.57	4413.00	3117.61	3163.83
		(30.8)	(27.0)	(21.9)	(9.9)	(8.1)	(7.53)
8	Sundarban Waterways	38.61	61.03	54.73	6558.70	10160.54	9202.31
		(4.6)	(5.6)	(4.3)	(14.7)	(26.5)	(21.92)
9	Icchamati & others	2.84	8.54	14.97		716.17	538.30
		(0.3)	(0.8)	(1.19)		(1.6)	(1.28)
Grand Total		**836.11**	**1087.93**	**1261.51**	**44552.10**	**38394.17**	**41988.96**

Source: 'Statistics of Inland Water Transport, 2022-23', 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.

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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 148701 MW out of which 133410.03 MW of hydropower potential is in stations with installed capacity over 25 MW as per the reassessment study-(2017-23). During 2022-23, the Hydel generation was 162098.77 GWh which was about 10.02% 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
11	2022-23	162098.77	10.02	240800.00*	17.16

Source: PDM Division, Central Electricity Authority, M/o Power
Note-1: '*': Provisional;
Note-2: '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 31.03.2023)

Region/ State	Identified Capacity as per Reassessment Study (2017-23)	Capacity In Operation		Capacity Under Active Construction $		Capacity on which Construction is held up		Capacity yet to be taken up under construction	
	(MW)	(MW)	%	(MW)	(%)	(MW)	(%)	(MW)	%
1	2	3	4	5	6	7	8	9	10
Northern									
Jammu & Kashmir	12264.50	3360.00	27.40	3051.50	24.88	48.00	0.39	5805.00	47.33
Ladakh	707.00	89.00	12.59	0.00	0.00	0.00	0.00	618.00	87.41
Himachal Pradesh	18305.00	10263.00	56.07	2446.00	13.36	44.00	0.24	5552.00	30.33
Punjab	1300.73	1096.30	84.28	206.00	15.84	0.00	0.00	0.00	0.00
Haryana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rajasthan	411.00	411.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Uttarakhand	13481.35	3975.35	29.49	1324.00	9.82	247.00	1.83	7935.00	58.86
Uttar Pradesh	501.60	501.60	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub Total (NR)	**46971.18**	**19696.25**	**41.93**	**7028.00**	**14.96**	**339.00**	**0.72**	**19908.40**	**42.38**
Western									
Madhya Pradesh	2819.00	2235.00	79.28	0.00	0.00	400.00	14.19	184.00	6.53
Chhattisgarh	1311.00	120.00	9.15	0.00	0.00	0.00	0.00	1191.00	90.85
Gujarat	550.00	550.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
Maharashtra	3144.00	2647.00	84.19	0.00	0.00	0.00	0.00	497.00	15.81
Goa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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

(as on 31.03.2023)

Region/ State	Identified Capacity as per Reassessment Study (2017-23)	Capacity In Operation		Capacity Under Active Construction $		Capacity on which Construction is held up		Capacity yet to be taken up under construction	
	(MW)	(MW)	%	(MW)	(%)	(MW)	(%)	(MW)	%
1	2	3	4	5	6	7	8	9	10
Sub Total (WR)	**7824.00**	**5552.00**	**70.96**	**0.00**	**0.00**	**400.00**	**5.11**	**1872.00**	**23.93**
Southern									
Andhra Pradesh	2596.00	1610.00	62.02	960.00	36.98	0.00	0.00	26.00	1.00
Telangana	1302.00	800.00	61.44	0.00	0.00	0.00	0.00	502.00	38.56
Karnataka	4414.40	3689.20	83.57	0.00	0.00	0.00	0.00	725.20	16.43
Kerala	2472.75	1864.15	75.39	140.00	5.66	0.00	0.00	468.60	18.95
Tamil Nadu	1785.20	1778.20	99.61	0.00	0.00	0.00	0.00	7.00	0.39
Sub Total (SR)	**12570.40**	**9741.55**	**77.50**	**1100.00**	**8.75**	**0.00**	**0.00**	**1728.80**	**13.75**
Eastern									
Jharkhand	300.00	210.00	70.00	0.00	0.00	0.00	0.00	90.00	30.00
Bihar	130.10	0.00	0.00	0.00	0.00	0.00	0.00	130.10	100.00
Odisha	2824.50	2154.55	76.28	0.00	0.00	0.00	0.00	670.00	23.72
West Bengal	809.20	441.20	54.52	120.00	14.83	0.00	0.00	248.00	30.65
Sikkim	6051.00	2282.00	37.71	620.00	10.25	417.00	6.89	2732.00	45.15
Sub Total (ER)	**10114.80**	**5087.75**	**50.30**	**740.00**	**7.32**	**417.00**	**4.12**	**3870.10**	**38.26**
North Eastern									
Meghalaya	2026.00	322.00	15.89	0.00	0.00	0.00	0.00	1704.00	84.11

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

(as on 31.03.2023)

Region/ State	Identified Capacity as per Reassessment Study (2017-23)	Capacity In Operation		Capacity Under Active Construction $		Capacity on which Construction is held up		Capacity yet to be taken up under construction	
	(MW)	(MW)	%	(MW)	(%)	(MW)	(%)	(MW)	%
1	2	3	4	5	6	7	8	9	10
Tripura	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manipur	615.00	105.00	17.07	0.00	0.00	0.00	0.00	510.00	82.93
Assam	643.00	350.00	54.43	120.00	18.66	0.00	0.00	173.00	26.91
Nagaland	325.00	75.00	23.08	0.00	0.00	0.00	0.00	250.00	76.92
Arunachal Pradesh	50394.00	1115.00	2.21	4880.00	9.68	0.00	0.00	44399.00	88.10
Mizoram	1926.70	60.00	3.11	0.00	0.00	0.00	0.00	1866.70	96.89
Sub Total (NER)	**55929.70**	**2027.00**	**3.62**	**5000.00**	**8.94**	**0.00**	**0.00**	**48902.70**	**87.44**
All India	**133410.03**	**42104.55**	**31.56**	**13867.50**	**10.39**	**1156.00**	**0.87**	**76282.00**	**57.18**

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

Note 1: (i). Does not include pumped storage projects.
(ii). In addition to above 8 PSS (4745.6 MW) are under operation, 3 PSS (2700 MW) are under active construction, 1 PSS (80 MW) on which construction is held up, 1 PSS (1000 MW) is Concurred by CEA, 24 PSS (29260 MW) are under S&I, 1 PSS (1350 MW) is Under Examination & 5 PSS (5320 MW) are under S&I held up.
(iii) '$': The above list includes 1 Multi-purpose Project (MPP) namely Lakhwar MPP (300 MW) in Uttarakhand.
Note 2: Multi-purpose projects (International Projects) are under examination (India and Nepal) namely, Pancheshwar MPP (2400 MW) whose DPR is being revised & Rupali Garh Regulating Dam (120 MW) which is Under S&I.
Note 3: DPR of Goriganga-IIIA H.E. project has been suspended due to tariff issues and examination shall be continued after issues are resolved with State Govt.

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

(as on 31.03.2023)

Basin	Identified Capacity as per Reassessment Study (2017-23)	Capacity In Operation		Capacity under Active Construction $		Capacity on which Construction is held up		Capacity yet to be taken up under Construction	
	MW	(MW)	%	(MW)	%	(MW)	%	(MW)	%
1	2	3	4	5	6	7	8	9	10
Indus	32322.23	14637.30	45.29	6003.50	18.57	48.00	0.15	11633.40	35.99
Ganga	15591.25	5687.15	36.48	1024.00	6.57	291.00	1.87	8589.10	55.09
Central Indian Rivers	4498.50	3159.80	70.24	0.00	0.00	400.00	8.89	938.70	20.87
West Flowing Rivers	70001.95	5684.35	81.18	140.00	2.00	0.00	0.00	1177.60	16.82
East Flowing Rivers	11269.40	8248.95	73.20	960.00	8.52	0.00	0.00	2060.50	18.28
Brahmaputra	62726.70	4687.00	7.47	5740.00	9.15	417.00	0.66	51882.70	82.71
All India	**133410.03**	**42104.55**	**31.56**	**13867.50**	**10.39**	**1156.00**	**0.87**	**76282.00**	**57.18**

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

Note 1: (i). Does not include pumped storage projects.
(ii). In addition to above 8 PSS (4745.6 MW) are under operation, 3 PSS (2700 MW) are under active construction, 1 PSS (80 MW) on which construction is held up, 1 PSS (1000 MW) is Concurred by CEA, 24 PSS (29260 MW) are under S&I, 1 PSS (1350 MW) is Under Examination & 5 PSS (5320 MW) are under S&I held up.
(iii). '$': The above list includes 1 Multipurpose Project (MPP) namely Lakhwar MPP (300 MW) in Uttarakhand.
Note 2: Multi-purpose projects (International Projects) are under examination (India and Nepal) namely, Pancheshwar MPP (2400 MW) whose DPR is being revised & Rupali Garh Regulating Dam (120 MW) which is Under S&I.
Note 3: DPR of Goriganga-IIIA H.E. project has been suspended due to tariff issues and examination shall be continued after issues are resolved with State Govt.

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Section – VIII
International Treaties and Cooperation

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

This Section consists of the list of 14 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.

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. India-Australia JWG meetings has been held so far and as per JWG meeting held on 11-13th July, 2018, collaboration on following 2 projects viz. i. Irrigation efficiency pilot project and ii. Brahmani-Baitarni Integrated Water Resources Management Phase are being taken up. 3rd Joint Working Group Meeting between India and Australia under renewed MoU was held on 22th September, 2020. i. Irrigation Efficiency Pilot Project 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. Following issues has been agreed under Working program for bilateral Hungarian-Indian Cooperation for the period of 2021-2023: i. Integrated water resources management ii. Flood management iii. Drought and water scarcity management iv. Rejuvenation of rivers and other water bodies v. Research and education 1st Pre Meeting of the JWG was held virtually on dated 20.11.2020. The pre JWG Indo-Hungary meeting was held on 20.11.2020 under 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

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Sl. No.	MoU Details	Current Progress/ Status of Activities undertaken
		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. MoU automatically renewed w.e.f. 14.12.2022 for a further period of 5 years as per automatic renewal clause in MoU. 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. 3rd Joint Working Group (JWG) meeting was held on 13th July, 2021 via virtual platform under the joint chairmanship of Commissioner (CAD)- D/o WR, 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. 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. 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. i. River Basin Management, ii. Irrigation and Efficient Water Use iii. E-Flows Assessment and 4) Safe Reuse of Treated Water.

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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 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. 1st JWG meeting was held on 03.05.2018 in India. 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. 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. 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.

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Sl. No.	MoU Details	Current Progress/ Status of Activities undertaken
		Suggestive list of activities proposed by Principal Representative/Interlocutor: i. Collaborating in Developing Integrated Hydrological Modeling Tools. 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.) iii. Stream channel Morphology, Erosion Processes and Geomorphology. Ecological Flows. iv. Aquifer Mapping in 2D/3D, Aquifer Response Modeling, Aquifer Management, Coastal Aquifer Management. v. Capacity Building& Technology transfer. 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. 1st JWG Meeting was held in Tanzania on 17.05.2019. 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. 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 Exchange of experts and organization of training programs; study tour in the areas of development and management of water resources, both surface and groundwater.

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Sl. No.	MoU Details	Current Progress/ Status of Activities undertaken
		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.
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. 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. 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 year unless either of the parties given a written notice before 6 months of its expiry to terminate the MoU. 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. 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. 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.

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Sl. No.	MoU Details	Current Progress/ Status of Activities undertaken
		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. A suggestion for visit of Indian experts to Fiji to train Fijian officials on issues related to water engineering, hydrology, modelling etc. MEA has been requested to take up the matter with Fijian Government for sending a format proposal seeking training in water 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. Cooperation in the field of water resources development and management, both surface and ground water through the sharing of technical expertise and experiences. 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. 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. 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. 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.

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Sl. No.	MoU Details	Current Progress/ Status of Activities undertaken
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.
16.	MoU between India and Denmark	MoU between India and Denmark in the field of water resource development and management was signed on 12.09.2022 for five years. MoU also includes establishment of Centre of Excellence for Smart Water Resources Management (CoESWaRM) and Smart Lab for clean rivers in Varanasi. M/o Jal Shakti has constituted Joint Steering Committee (JSC) in respect of establishment of Smart lab at Varanasi, with representatives from both countries with terms of reference which inter-alia includes that the JSC will evaluate scope of work and devise work plan along with man power and other requirement within 4 months. Finalization of ToR for establishment of CoESWaRM at New Delhi is under deliberation with Denmark.

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. The last (38th) meeting of JRC was held at New Delhi on 25th August, 2022.

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) MoU on withdrawal of up to 153 cusecs of water each by India and Bangladesh from common border river Kushiyara (signed on 6th September, 2022)

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. So far 80 meetings of the Joint Committee have taken place.

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.

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 9th meeting was held during 7-8th 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 6th meeting of JTT was held during 12 -13th 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. A total of 118 meetings of PIC have been held so far. The last meeting was held in May, 2022 at New Delhi.

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 13th meeting of ELM was held on 18th May, 2022 through video-conferencing.

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. The renewal of MoU on Brahmaputra River (expiring in June, 2023) is proposed to be undertaken in the ensuing 14th ELM meeting.

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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 1st July to 30th 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.

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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.

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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.

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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.

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